TECHNOLOGY DEPT.

Gas Journal

VO.. 289. 109th YEAR. LONDON, JANUARY 23, 1957. Nº 4880. PRICE 1/6

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FEB 20 1957
DETROIT

a measure of importance—

The Greeks had a name for it—the Olympic Foot—a measure used in agriculture and it was nearly right! It measured 12.17 inches. On the other hand experience, technical resource and modern production techniques within the integrated U.G.I. group have evolved meters built upon known sound principles—such meters offer prolonged accuracy throughout a long life.

U·G·I GROUP

ALDER & MACKAY LTD. J. H. ROBINSON & CO. (LIVERPOOL) LTD. SMITH METERS LTD
SUTHERLAND METER CO. LTD. VANDA METERS LTD. WILLEY & CO. LTD

BUCKLERSBURY HOUSE TO STAND ON 3,500 BORED PILES

This important Office Building in the City of London, 17 storeys high including the basement floors, is supported on Cementation Bored Piles. Approximately 3,500 were constructed well within the contract time despite the fact that delays were unavoidably occasioned by the deliberations on the fate of the Mithras Temple discovered on the site and other major difficulties inevitable on such a large site.

The construction of a surrounding wall to retain the adjoining Queen Victoria Street, Cannon Street and Bucklersbury was greatly facilitated by the use of our bored piles.

The close proximity of important buildings including the Mansion House and services such as the Underground Railway made it necessary to reduce noise, vibration, etc., to an absolute minimum.

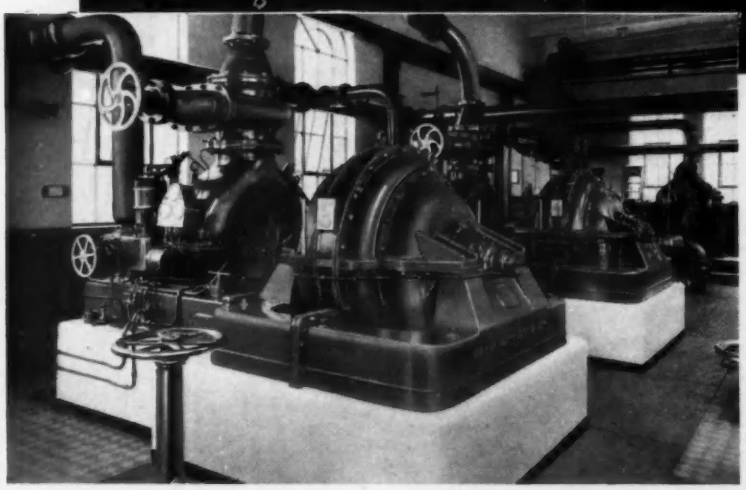
The CEMENTATION COMPANY LIMITED

London Office: 20, Albert Embankment, S.E.11. Telephone: RELiance 7654

BENTLEY WORKS, DONCASTER. Tel: 54175-6-7-8-9

'C.M.' TYPE TURBO BOOSTERS

for medium volumes and higher pressures



Photograph by courtesy of South Eastern Gas Board

- LARGER CAPACITIES IN SMALLER SPACES
- HIGHER EFFICIENCIES
- IMPROVED MECHANICAL DESIGN

'CM' 62 Two Stage Turbo Boosters each to pass 500,000 cubic feet per hour at 5 lbs per square inch (Gas—specific gravity = .55) Driven by 260 b.h.p. Brotherhood Turbines running at 7,000 r.p.m.

Installed at Waddon Works, Croydon, for the supply of gas to:— Redhill, Horley, and Crawley New Town.

THE BRYAN DONKIN CO. LTD.

DERBY ROAD · CHESTERFIELD

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- THERMOSTATIC CONTROL
- FLAME FAILURE CONTROL SYSTEMS
- MAIN COCKS • JET COCKS
- NON FERROUS PIPE FITTINGS

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GEORGE GLOVER & CO. LTD.

dependable year-in year-out

DOMESTIC METERS

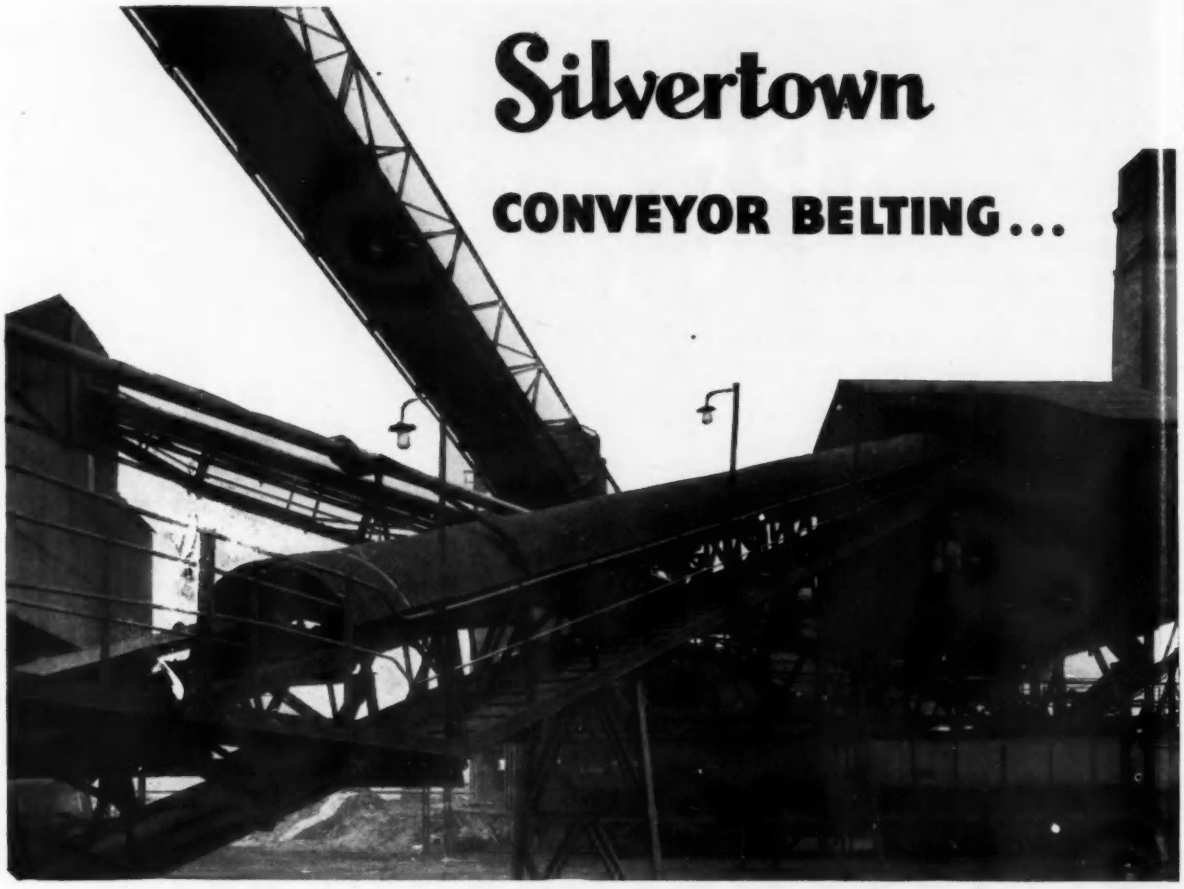
INDUSTRIAL METERS

TEST METERS

Product of Radiation Ltd.

GAS METERS

122 KINGS ROAD CHELSEA LONDON S.W.3
BRANCH WORKS: WARRINGTON · LEEDS · MANCHESTER · CARDIFF



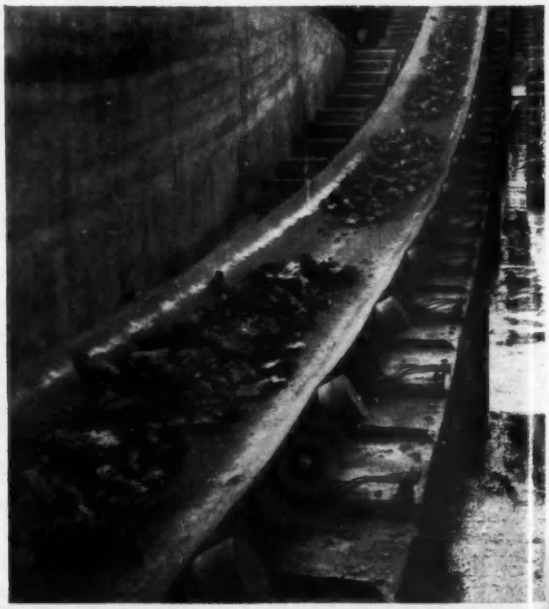
Silvertown

CONVEYOR BELTING...

...carries the entire load

Every foot of this extensive system of conveyors at Randolph Coke Ovens, County Durham, is equipped with Silvertown Grade A belting. Much of it has been in use for eight years, yet despite the very high tonnage of coke handled the belts are still in excellent condition.

Proof of the superiority of Silvertown conveyor belting is constantly provided by satisfied users all over the country, wherever materials must be handled with maximum efficiency and at minimum cost. The Silvertown range covers every application, and a technical advisory service is available to recommend the grade best suited to your needs.



SPLICING SERVICE

Silvertown belts are spliced on site by a team of experienced operatives. Belt ends are permanently locked together . . . there's no added thickness at the joint . . . no loss of flexibility.

SILVERTOWN RUBBER COMPANY LTD HERGA HOUSE, VINCENT SQUARE, LONDON S.W.1

gas measurement

It is prolonged accuracy over a long meter life which counts.

Experience, technical resource and modern production techniques within the Smith Meters organisation have evolved meters to meet this demand.

This illustration shows the D1 prepayment meter by

SMITH METERS LIMITED

186 Kennington Park Road, London, S.E.11

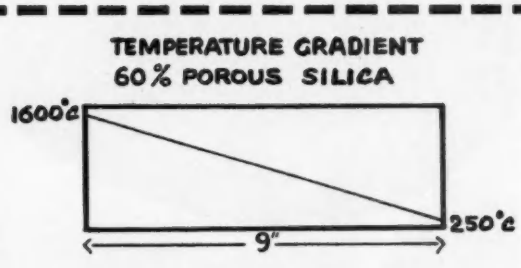
U·G·I GROUP

CONSETT POROUS SILICA

A really high-temperature INSULATION...

- Developed and manufactured by the Consett Iron Company Limited, "Porous" Silica Insulating Bricks have become established as an important addition to the existing range of refractories.
- Possessing the advantages of a normal silica brick combined with high thermal efficiency, "Porous" Silica offers to the furnace builder a spalling resistant silica refractory suitable for hot-face insulation at high temperatures.
- Already in wide use in the glass industry for roof insulation "Porous" Silica Brick is also suitable for the construction of kiln roofs and side walls where its light weight and insulating properties are important factors in design and service.
- "Porous" Silica Bricks are made in two grades, 60% and 50% porosity, the latter possessing a higher mechanical strength, rendering it the most suitable for constructional work.

Further information will be gladly supplied on request.



The high insulation value of "Porous" Silica considerably reduces the total wall thickness necessary.

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CONSETT · CO. DURHAM · ENGLAND

Telephone: Consett 341 (12 lines) • Telegrams: STEEL PHONE, Consett.

Monk on National Service

Again associated, as they have been on many other occasions, with N.C.B. development work, Monk played a part in the construction of the Avenue Carbonisation Plant at Chesterfield. Equipped technically and mechanically to speed such National undertakings, Monk's contribution to building Industrial Britain is naturally considerable.

Building, Civil Engineering and Reinforced Concrete Contractors.

monk **Warrington and London**

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Head Office: Padgate, Warrington. Tel: Warrington 2381.
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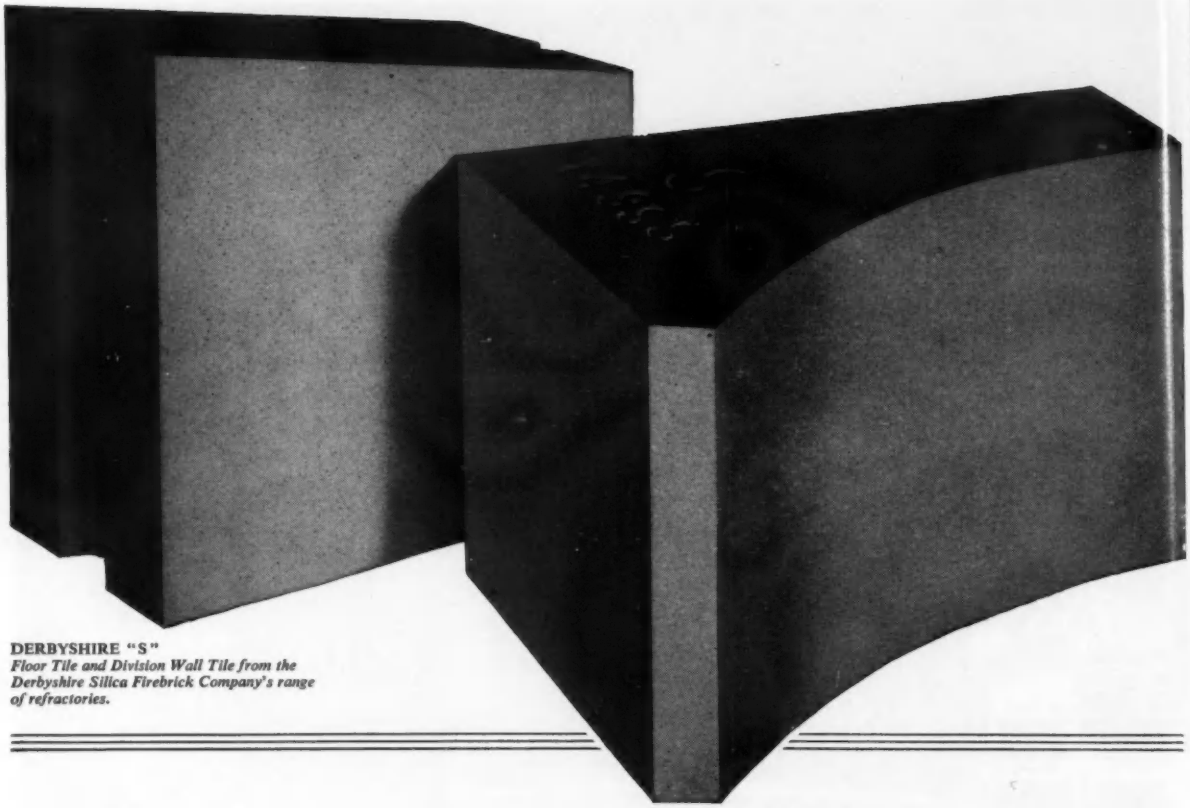

DERBYSHIRE "S"
Floor Tile and Division Wall Tile from the Derbyshire Silica Firebrick Company's range of refractories.

DERBYSHIRE SILICA—the name known throughout industry for first class refractories.

DERBYSHIRE "S" and "D.S.F."
(*90% Silica*)

Refractories for all purposes including Vertical and Horizontal Retorts, Soakers, Puddling Furnaces, Reheating and Annealing Furnaces, Forge Furnaces, Checkers, Cupolas and Glass Furnaces.

Other D.S.F. products include
PEAKSIL (*95% Silica*) FRISIL (*Sillimanite*)
DUROSIL
(*The new British Plastic Refractory*)
and DOME INSULATION (*Diatomite*)

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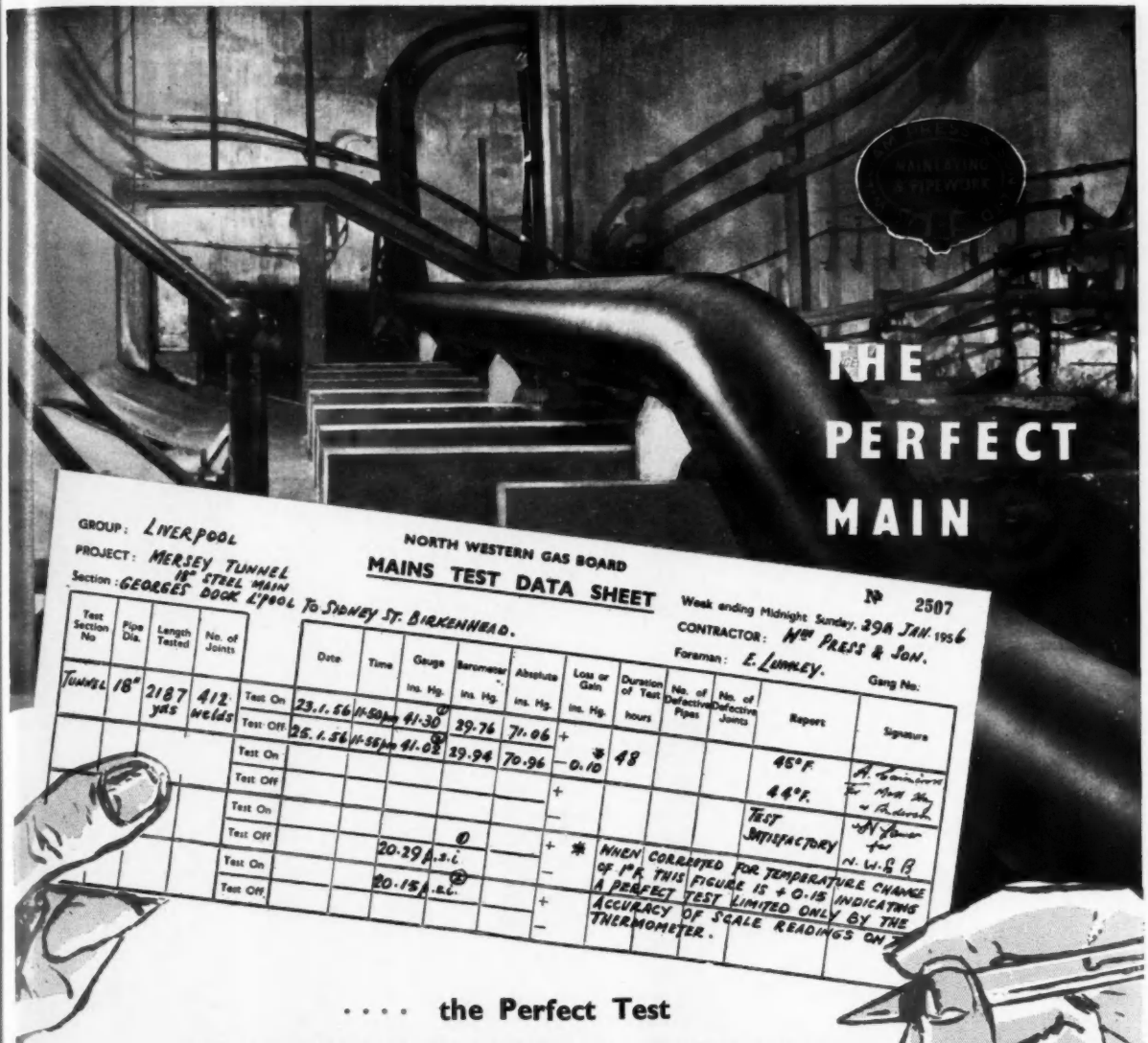
FRIDEN . HARTINGTON . NEAR BUXTON . DERBYSHIRE
GRAMS : SILICA, FRIDEN, HARTINGTON
PHONE : YOULGRAVE 271 (3 LINES)


THE
PERFECT
MAIN
NORTH WESTERN GAS BOARD
MAINS TEST DATA SHEET
GROUP: LIVERPOOL
PROJECT: MERSEY TUNNEL 18" STEEL MAIN
Section: GEORGES DOCK L'POOL To SIDNEY ST. BIRKENHEAD.
№ 2507
Week ending Midnight Sunday. 29th JAN. 1956
CONTRACTOR: Wm PRESS & SON.
Foreman: E. LUMLEY.
Test Section No
Pipe Dia.
Length Tested
No. of Joints
Date
Time
Gauge ins. Hg.
Barometer ins. Hg.
Absolute ins. Hg.
Loss or Gain ins. Hg.
Duration of Test hours
No. of Defective Pipes
No. of Defective Joints
Report
Signature
Gang No.
TUNNEL 18" 2187 yds 412 welds
Test On 23.1.56 11-50pm 41-30 29.76 71.06 + 48 45°F.
Test Off 26.1.56 11-55pm 41-02 29.94 70.96 − 0.10 44°F.
TEST SATISFACTORY
WHEN CORRECTED FOR TEMPERATURE CHANGE OF 1°F. THIS FIGURE IS + 0.15 INDICATING A PERFECT TEST LIMITED ONLY BY THE ACCURACY OF SCALE READINGS ON THERMOMETER.

.... the Perfect Test

YET ANOTHER PROOF OF HIGH QUALITY WORK BACKED BY 43 YEARS' EXPERIENCE

As many millions of people use the Mersey Tunnel yearly, the installation of the 18" Gas Main called for workmanship and organisation of the highest order. Every welded joint was subjected to radiographic inspection to ensure that the ½" thick Steel Main was equal in strength throughout its total length of 6,600 ft. In addition, we were responsible for laying the 4,000 yds. of 18" Cast Iron Approach Mains in the densely built-up areas of Liverpool and Birkenhead, which is just another example of our organisation's versatility.

CAST IRON AND STEEL MAINLAYING — ALL TYPES OF INDUSTRIAL PIPEWORK INSTALLATION — PIPE FABRICATORS TO LLOYDS SPECIFICATION.

William Press and Son Ltd.

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Telephone: WHitehall 5731 (7 lines)
Telegrams: Unwater, Parl, London.

Willoughby Lane, Tottenham, N.17.
Telephone: TOTtenham 3050 (12 lines)
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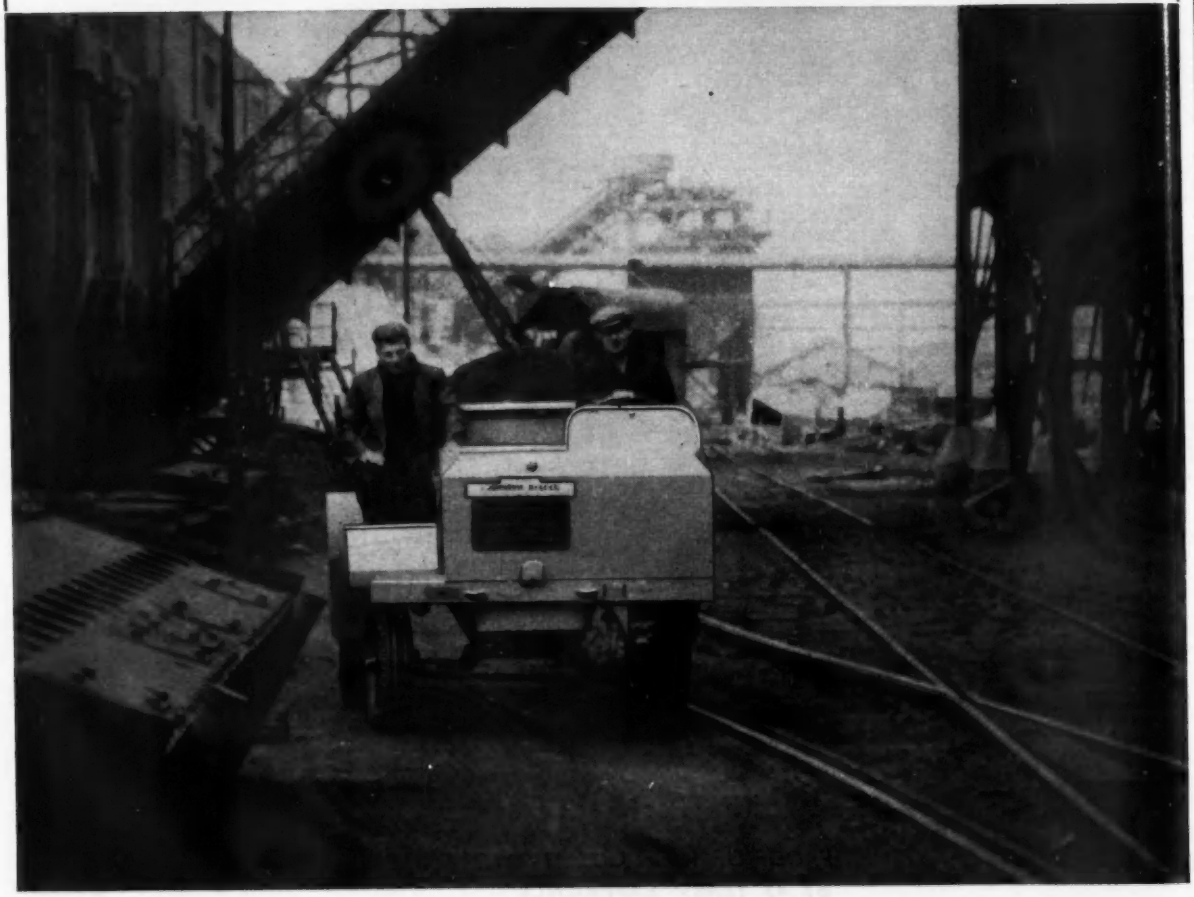
London gasworks choose JOHNSON

2 cu. yd. diesel dumper for manoeuvrability



Engine forward drive for maximum visibility

Exceptional manoeuvrability, combined with remarkably low running costs (about 4d. an hour under average conditions) are just two of the reasons for the choice of Johnson 2 cubic yard Diesel Dumpers as general utility vehicles at a London gasworks. These dumpers give extremely good performance under the most rigorous conditions. Their industrial type power unit, a Petter A.V.A. 2T Series 2, twin cylinder, air-cooled diesel engine, provides ample power for operation under all conditions. Transmission, clutch, gear-box, propeller-shaft, couplings and drive axle are all heavy duty components, rated to give long-life and hard wear. A welded steel-plate skip carries 2 tons payload. It is self-tipping and returning, shelved to prevent spillage. Heaped capacity is two cubic yards. General dimensions of the Johnson 2 cubic yard Diesel Dumpers are: Track (centre of driving wheels) 5′1″, Wheelbase 5′9″; Ground Clearance 1′1¼″; Nett weight 1 ton 9 cwts. 2 qrs; Skip Height for loading 5′; Turning Circle 28′2″; Overall Width 6′8¾″. Write for illustrated leaflet GJ/14/1103

C. H. JOHNSON (MACHINERY) LTD., ADSWOOD, STOCKPORT, CHESHIRE. *Telephone: STOckport* 2642/5. *Telegrams: 'Machinery' Stockport. London Tel.: Prospect* 7671 *Glasgow Tel.: Kilmacolm* 558.

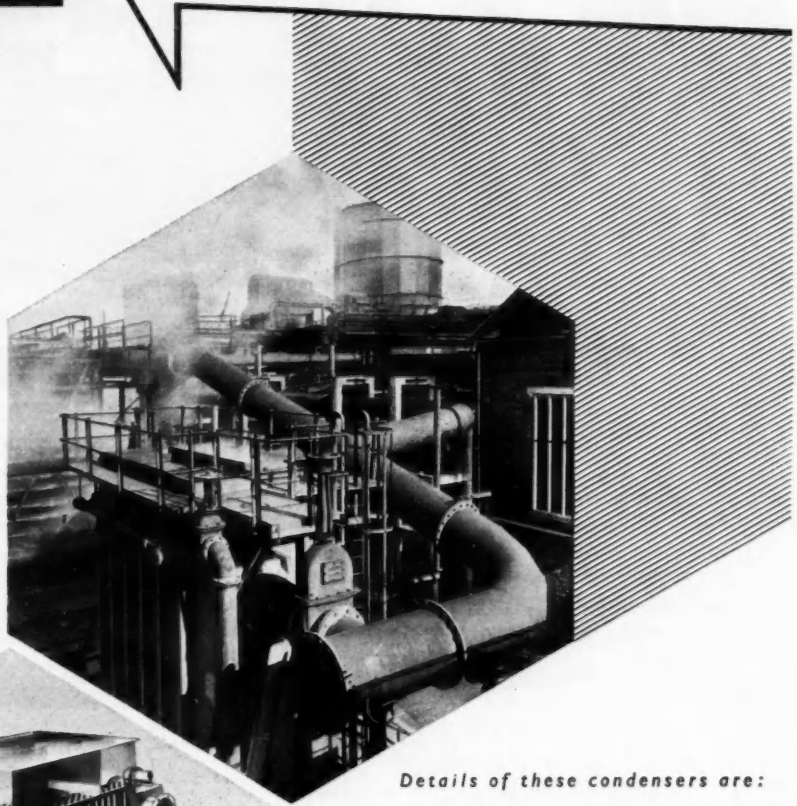
I see it's a JOHNSON MACHINE that's good!

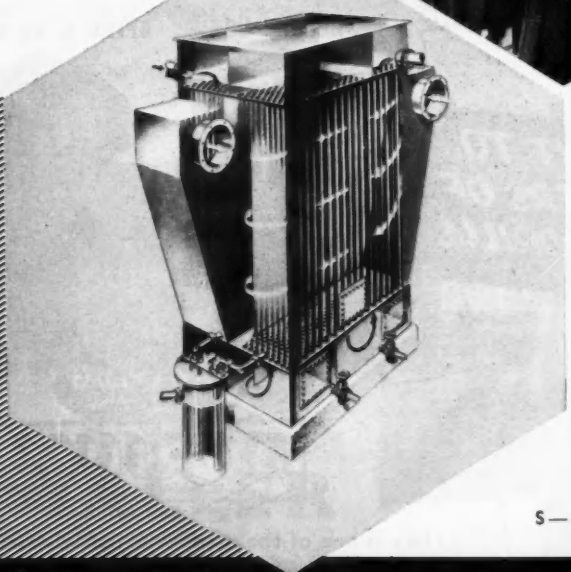
EST. 1750

WHESSOE

CROSS FLOW CONDENSERS

Since the introduction of this extremely efficient gas cooling unit 20 have been placed on order and 13 of them are already in operation. The total capacity of these condensers is over 80,000,000 cu. ft. per day.





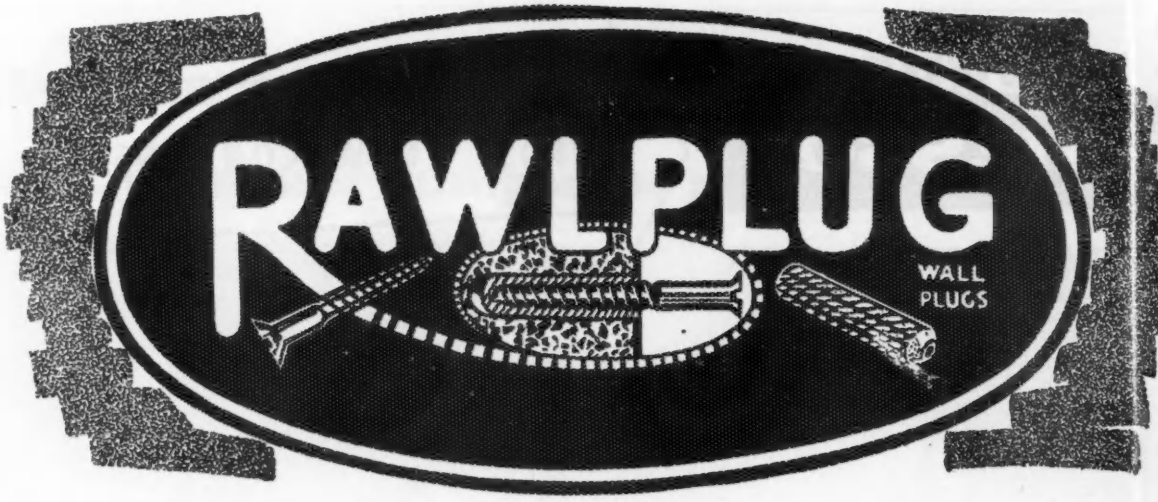
Details of these condensers are:

Customer and Location	No. Condensers	Total Capacity of Condensing Plant
Scottish G.B., Paisley	2 (P)	8 mill. cu. ft./day*
W. Midlands G.B., Redditch	2 (P)	3½ ,, ,, ,, *
Wales G.B., Aberavon	2 (S)	6½ ,, ,, ,, *
N. Western G.B., Linacre	2 (P)	8 ,, ,, ,, *
N. Western G.B., Bolton	2 (S)	8 ,, ,, ,,
Consett Iron Co., Consett	3 (P)	24 ,, ,, ,, †
S. Western G.B., Devonport	1	2½ ,, ,, ,, *
S. Eastern G.B., Gillingham	2 (S)	3 ,, ,, ,, *
E. Midlands G.B., Neepsend	2 (P)	5 ,, ,, ,,
Southern G.B., Oxford	2 (P)	12 ,, ,, ,,

*operating †2 condensers operating
S—series P—parallel Remainder building or on order

WHESSOE FOR GAS TREATMENT AND STORAGE

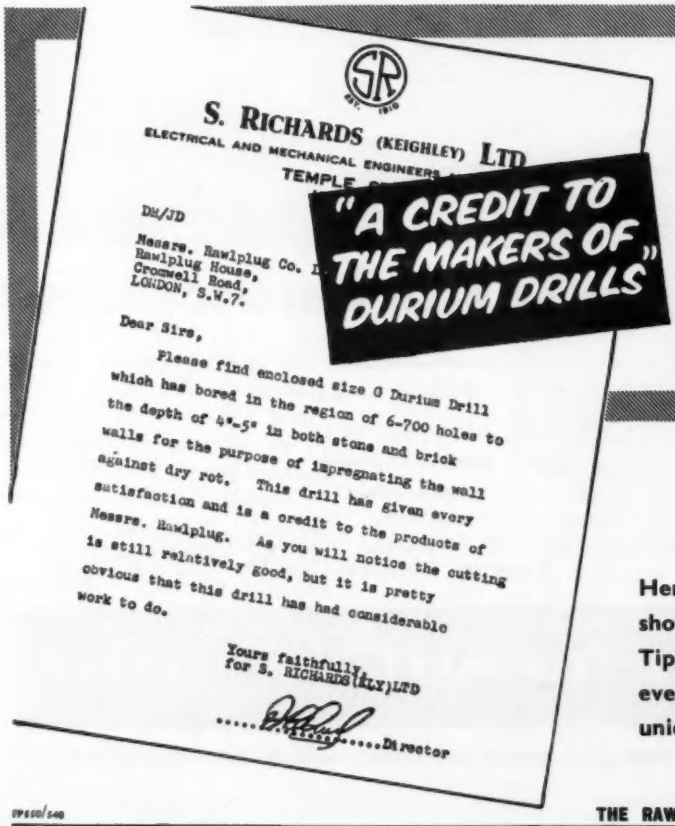
dvertisement of Whessoe Ltd., Darlington, England. Telephone: Darlington 5315 · London office: 25 Victoria Street, London, S.W.1. Telephone: ABBey 3881
W.86



THE NAME THAT CARRIES THE WEIGHT

Over the years the name Rawlplug has become internationally synonymous with efficient fixing in every kind of material. Rawlplug Fixing Devices and Tools provide firm, safe fixings in far less time than by any other method. If you have a fixing problem, please write to our Technical Service Department for free advice.

RAWLPLUGS · RAWLTOOLS · RAWLBOLTS · RAWLTAMPS · RAWLNUTS · BOLT ANCHORS · SCREW ANCHORS · WHITE BRONZE PLUGS · RAWLTOGGLE
RAWLCLIPS · CEMENT IN SOCKETS · DURIUM DRILLS AND HOLE BORING TOOLS FOR HAND, ELECTRIC HAMMER OR PNEUMATIC HAMMER OPERATION



S. RICHARDS (KEIGHLEY) LTD
ELECTRICAL AND MECHANICAL ENGINEERS
TEMPLE

DH/JD

Messrs. Rawlplug Co. L
Rawlplug House,
Cromwell Road,
LONDON, S.W.7.

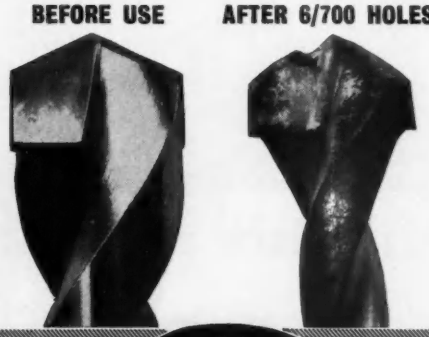
Dear Sirs,

Please find enclosed size G Durium Drill which has bored in the region of 6-700 holes to the depth of 4"-5" in both stone and brick walls for the purpose of impregnating the wall against dry rot. This drill has given every satisfaction and is a credit to the products of Messrs. Rawlplug. As you will notice the cutting is still relatively good, but it is pretty obvious that this drill has had considerable work to do.

Yours faithfully,
for S. RICHARDS (KLY) LTD

.....Director

"A CREDIT TO THE MAKERS OF DURIUM DRILLS"



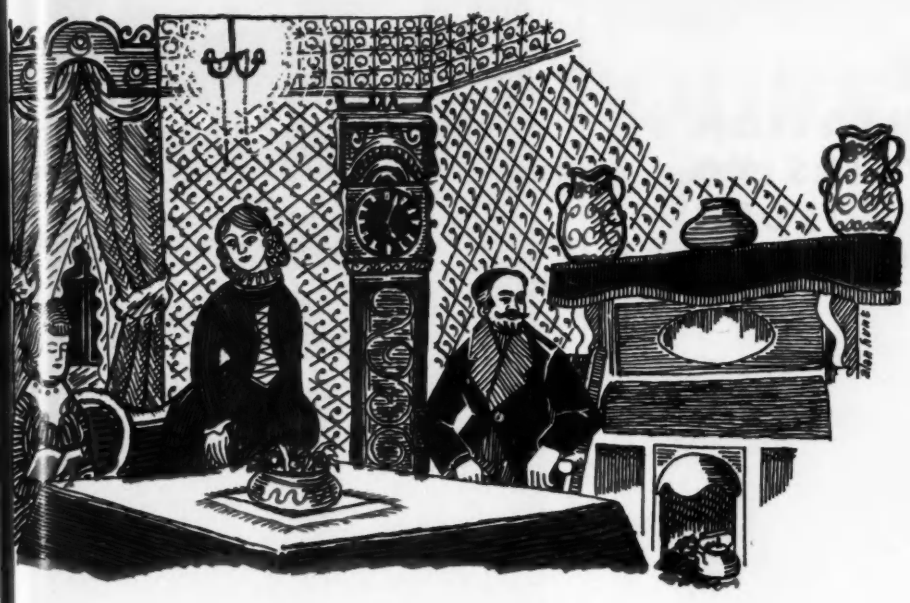
RAWLPLUG
DURIUM
Registered Trade Mark

Here is one of the many unsolicited testimonials showing the amazing performance of Durium Tipped Drills, the fastest cutting masonry drills ever made. Correctly used, Durium Drills are unique for reliability, speed and *long life*.

Descriptive folder gladly sent on request.

UP 550/548

THE RAWLPLUG COMPANY LTD., CROMWELL ROAD, LONDON, S.W.7

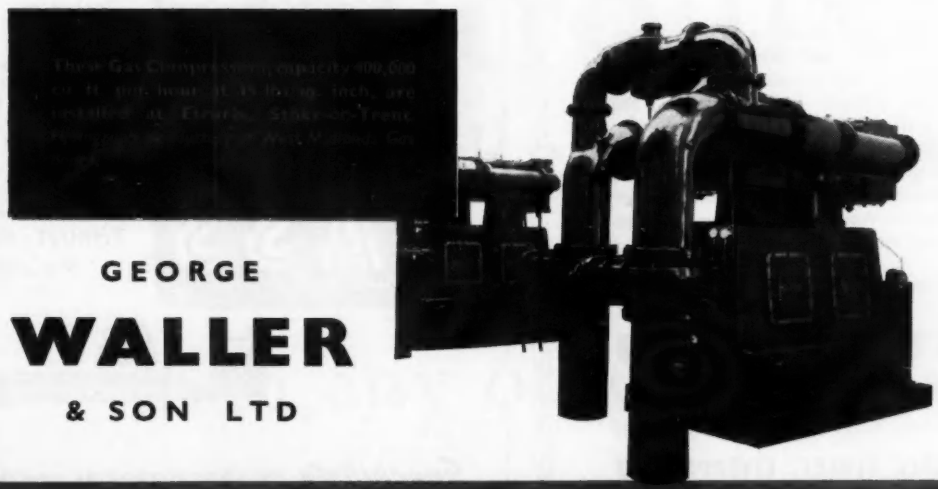


This Changing World

The Victorians by Gaslight

At eventide, the only sound to disturb the soft hiss of the gas is the occasional clop-clop of a passing hansom cab. Mamma reads an improving book, while Papa—tired from a day at his office—waits sleepily for the maid to announce that dinner is served.

By 1870 most well-to-do city homes were lit by gas, a transformation which the introduction of the successful fish-tail burner had done much to accelerate. Gas supplies too were becoming more reliable as operating experience was gained and specialised production plant installed, such plant and machines as, even then were coming from the Phoenix Iron Works at Stroud in Gloucestershire.



GEORGE
WALLER
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Phoenix Iron Works, Stroud, Glos.
Telephone: Brimscombe 2301/2

Member of the Society of British Gas Industries

GUNITE
& CEMENTATION
REPAIRS TO GASHOLDER STRUCTURES

SYSTEMATIC REPAIRS BASED ON SYSTEMATIC DIAGNOSIS OF DEFECTS

This 90-year-old gasholder tank at Barrow-in-Furness was reconditioned throughout prior to the installation of a new gasholder. The wall and dumpling were refaced with Gunite and the foundations were made good by pressure grouting. This tank is one of a number that we have reconditioned during the past twenty years. In each case the structure was carefully surveyed for defects before the reconditioning commenced, and in no two cases was the method of repair alike.

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Specialists in the Repair of Engineering Structures

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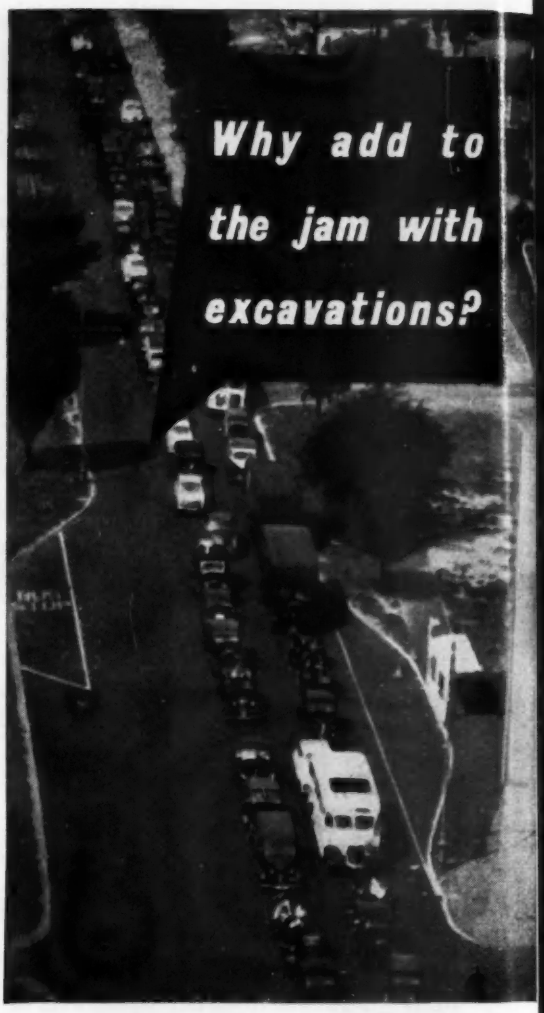
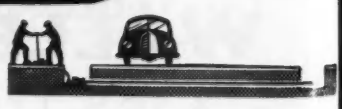


As the volume of traffic increases year by year, excavations on the roads become steadily more costly and inconvenient. They can be minimised by using the Pass Hydraulic Thrust Boring Machine for Underground pipe and cable installations. The machine offers a choice of four speeds and can be hand or power operated. Write for illustrated and detailed leaflet.

PASS
GAS AND WATER ENGINEERS

HYDRAULIC THRUST BORING MACHINE



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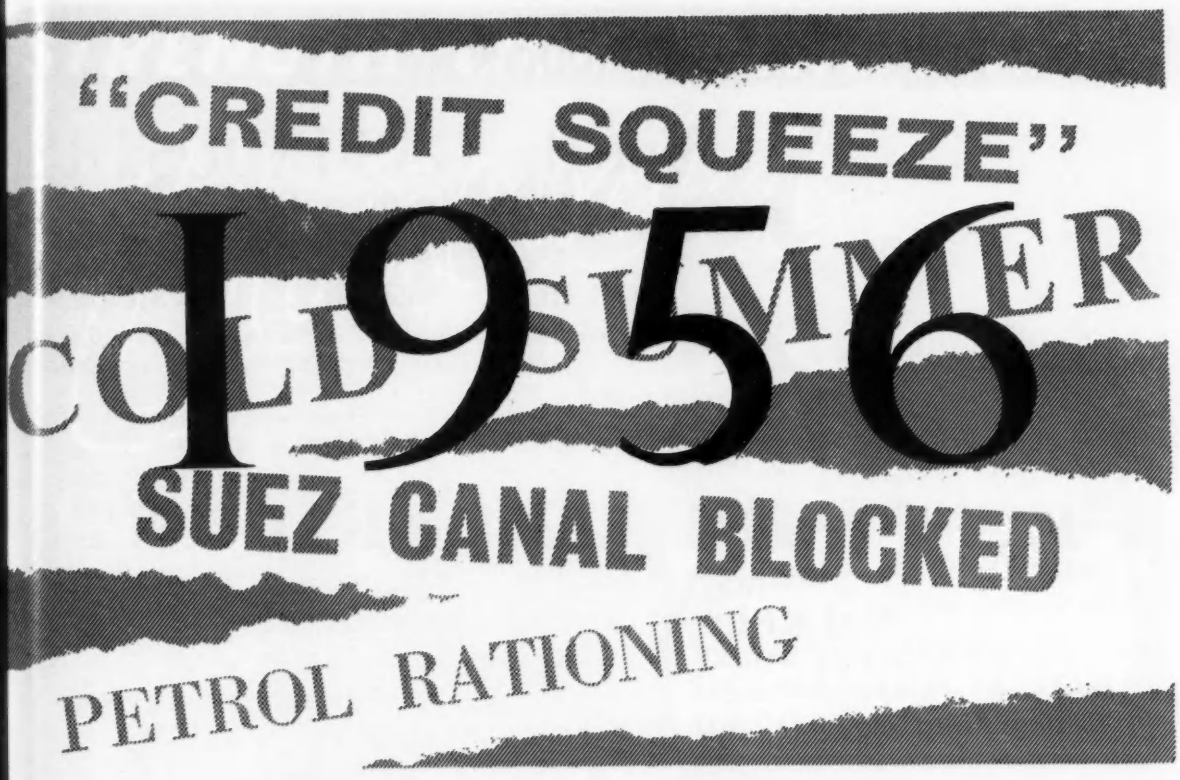
Tel: Denton 3001/2/3 Grams: "Tools", Denton, Manchester



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Domestic Refrigerators
were sold in 1956
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Contractors to the British Government, Crown Colonies, British Railways, National Coal Board, Area Gas Boards, Road Transport Executive, &c.

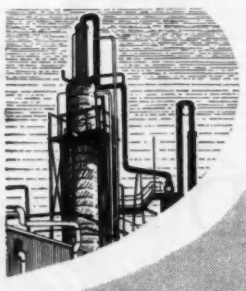
All round Protection from Corrosion

'HUMIDINE'

NON-SETTING

As a permanent barrier against corrosion, 'Humidine' non-setting paint provides complete protection for lower lift plates and cuppings, purifier lutes, governor bells and meter drums. It never dries or cracks and is impervious to moisture

Wherever the metal to be painted is in physical contact—use Aspinalls' Alkyd Gasholder Paints, they are worthy companions to 'Humidine'



AND THE ALKYD SYSTEM

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London Area Office: CHAFFINCH AVENUE, CROYDON, SURREY.

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Overseas Agents in TURKEY, CYPRUS, MALTA, WEST AFRICA, BELGIAN CONGO, KENYA, NYASALAND, PORTUGUESE EAST AFRICA, TANGANYIKA, ZANZIBAR, MAURITIUS, CEYLON, SIAM, SINGAPORE and MALAYA, BARBADOS, BRITISH GUIANA, TRINIDAD.

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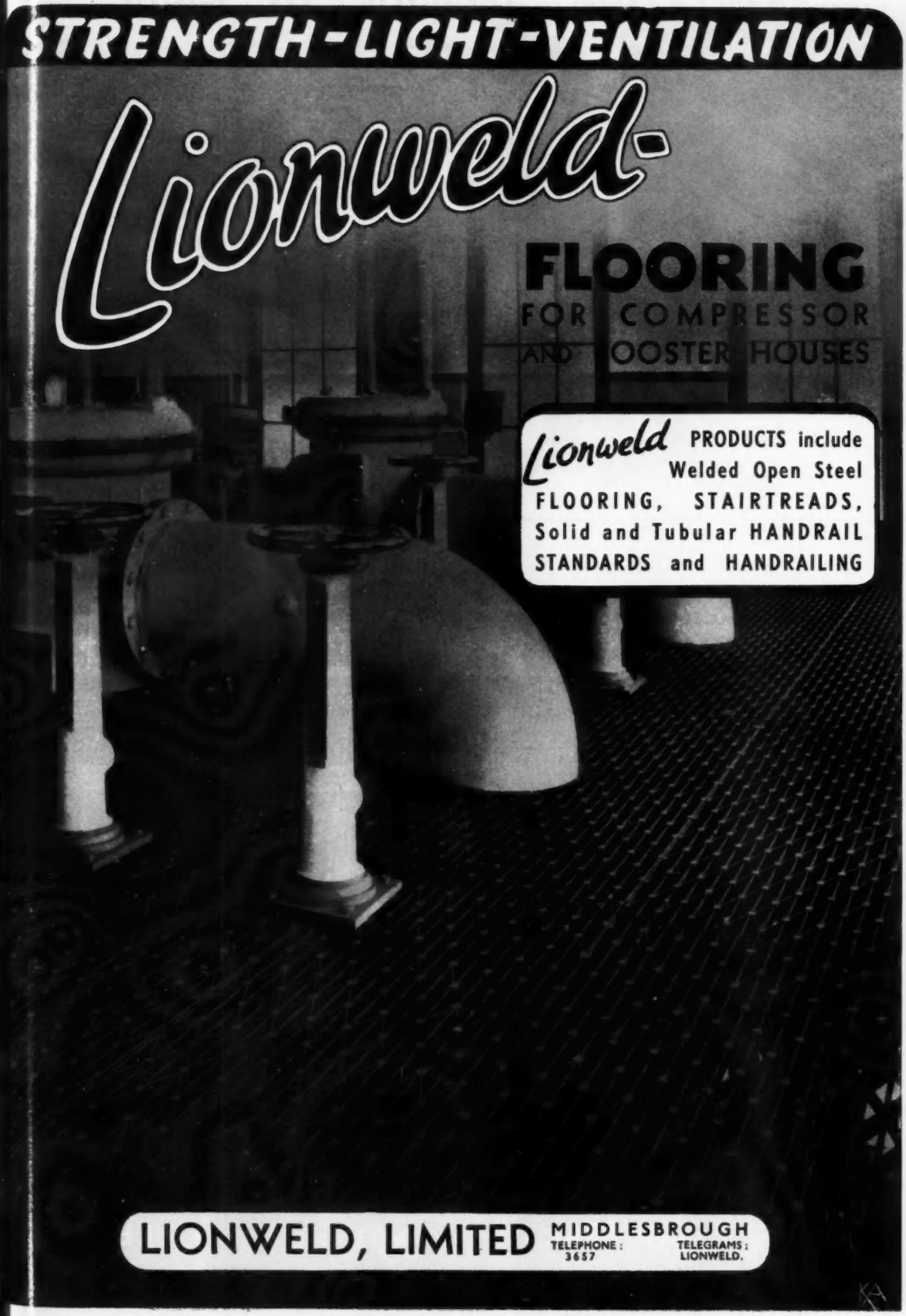
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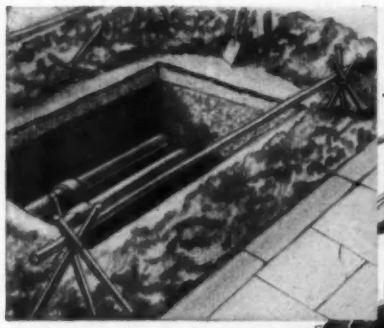

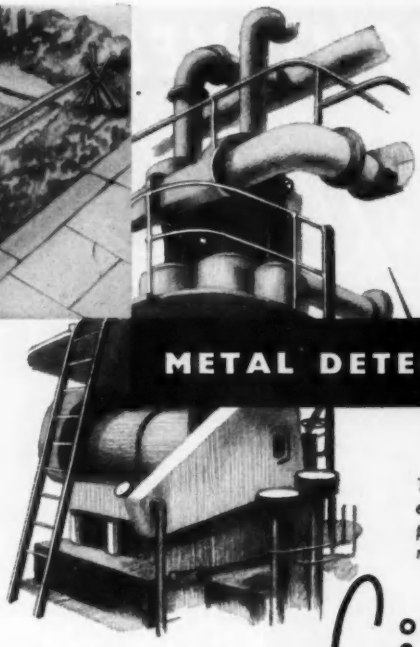

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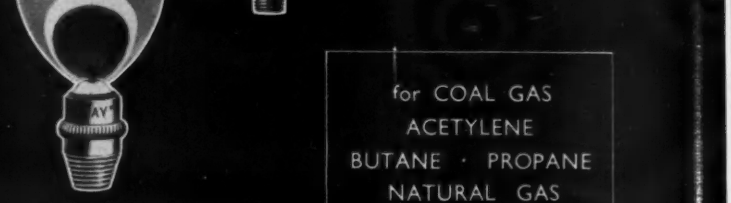

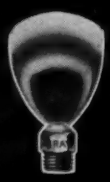

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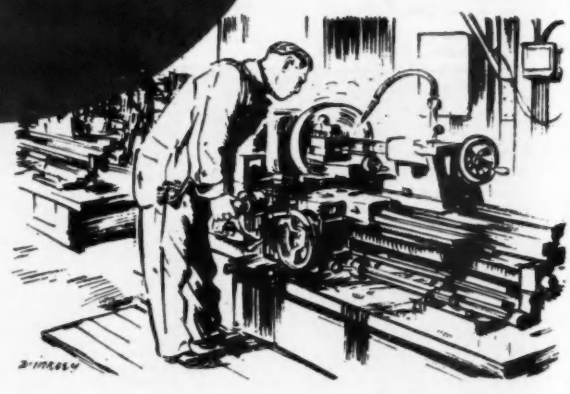

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Gas Journal

VOL. 289 NO. 4880 January 23, 1957

109TH YEAR

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Gas Journal

VOLUME 289. No. 4880. JANUARY 23, 1957. 109th YEAR

Gas at Work in Industry

EVERY year the annual reports of the area boards highlight anew the growing importance of the industrial consumer. Gas has clearly got to fight all the way to hold its share of the domestic and commercial loads, but on the industrial front—quite apart from any artificial and transient factors caused by crises in the oil industry—the load is on the up and up. More and more industrialists are finding out the advantages that gas can offer them. And there is the crux of the matter, as all too often they are having to find out for themselves, simply because the gas industry is doing little or no real promotional work to build up this valuable business. In comparison with the magnitude of the load, industrial gas personnel are small in number and hard pressed by the daily demands of their work; they have little time to indulge in publicity.

Nevertheless, it was a group of Industrial Gas Officers from the North Thames, South Eastern, Eastern, and Southern Gas Boards who, recognising the pressing need for active promotional work, got together to stage the Gas at Work in Industry Exhibition which opened yesterday at the Royal Horticultural Hall in London's Westminster. We congratulate them on this pioneer venture and their Boards on having given it their full support. Such an exhibition, being distinct from the many which take place every year aimed at the domestic consumer, was long overdue; and it is to be hoped that other boards will follow this excellent example. Certainly there is ample scope, for this exhibition has been planned exclusively to demonstrate the ways in which gas can meet the special needs and problems of the industrialist who operates in the area served by the four Boards; and his problems frequently differ substantially, say, from those of the industrialist in the Midlands.

This is not an exhibition of equipment. There is, of course, plenty of equipment to be seen; but it is there to illustrate the application of gas to the processes in which industrialists in the area are engaged. It is there, not because the manufacturer considered its presence would help his business, but because the four Boards decided that its inclusion would be of value to their exhibition. Moreover, those attending the exhibition are not there because of some poster or advertisement noticed casually in the Press but because, as industrialists and potential customers, they were personally invited by the Boards. As far as possible every piece of equipment shown is seen in operation so that visitors will be able to see at first hand how it may be of service in any applicable process in their manufacture.

Just how can gas be of special service to the industrialist? It can increase production, sometimes without change of plant; reduce production times; improve quality and reduce rejects; simplify production methods. And it can reduce smoke, improve working conditions, and increase efficiency in the use of fuel.

To illustrate these claims: In many a factory—particularly those engaged in the manufacture of textiles and paper—the rate of production is governed by the speed at which the finished article can be dried. With little change of plant this bottleneck can be removed by the installation of gas-fired flash driers of either flame contact or high temperature radiant heat type; and in any process of manufacture in which the heating, curing, or drying of material is involved production times can be speeded up by the incorporation of these forms of heating into existing production lines. Quality can be improved because the ease of control of gas appliances makes possible the attainment of the precise conditions required and their subsequent exact repetition. Consistency and reduced numbers of rejects follow automatically. To quote a case on record—the conversion to town gas of several tunnel kilns for the firing of wall tiles resulted in increased overall production of some 50% and the raising of first-quality yield by about 30%. And by its very nature gas must simplify many production methods—imagine the problems of the radio valve manufacturer if he had to complete all the delicate and intricate processes involved in the production, for example, of a triode hexode high vacuum tube by the heat of a furnace fire instead of a gas flame! What other advantages to industry did we claim for gas? Smoke abatement, improved working conditions—very important angles, but factors which we could hardly elaborate here without repeating much that has been said during the past year or so in discussions on the Clean Air Act. And the more efficient use of fuel: Perhaps we need say no more on this than point out that the very purpose of the exhibition is not merely

to encourage industry to use more gas, but to use it with maximum efficiency.

We have, of course, touched on only some of the advantages gas has to offer industry; and illustrated them with random examples as they came to mind. No doubt better examples could have been found, but the applications of gas to industry are so numerous that it is difficult for the untrained onlooker to know where to begin. Indeed, we realise that we have made no mention of two of the most important recent applications —automatic flame processing and the clean heat treatment of metals in radiant tube furnaces. But a tour of the exhibition will make good omissions, so let us move on to it—it will be found under review on pp. 181 to 193 of this issue.

The Priority of Efficiency

THE broadness of scope given to the new Minister of Power—who has taken over responsibility for the peaceful development of atomic energy—brings home still harder the point of view so frequently emphasised in these columns that an over-all plan is urgently needed for the fuel industries of this country. Sir Percy Mills has a difficult problem, namely, how to equate the principles of freedom of competition and so on that he must obviously subscribe to from his non-political, non-State, industrial background, with the overwhelming necessity for an integrated fuel policy. As far as the conventional sources of power are concerned, we suggest a priority target. Accepting that the N.C.B. is doing its reorganised best to increase productivity and production, what about a master-plan to ensure that our coal resources are used with the utmost efficiency?

Of course, things could not have gone on as they were much longer. What with one fuel crisis after another, any Government of this country was bound to realise the fatal consequences of further procrastination. Sir Percy's appointment could be just in time—if indeed his Ministry is to be omnipotent over all fuel. Perhaps 'omnipotent' is far too optimistic a word; but at least we may hope that it is nearly correct and that the Ministry will carry some useful executive powers. Some criticism of the appointment of an 'outsider' has been made on the grounds that Sir Percy is inexperienced in Parliamentary life and that he is not available in the Commons for mutilation by his inevitable critics. They are valid points of course but it might be added that the problems of the fuel situation are so obvious as to be supra-party; provided the steps he takes to overcome them are adequate there should be no critics that Mr. Maudling cannot accommodate in the other House.

The present disproportion over the use of coal is incredible. The Government's postulation since the coal industry was nationalised ten years ago has been that it is one grade of priority to have an efficient coal industry, but another entirely to ensure that coal is used efficiently. N.C.B. policy does not cover the latter question at all. The heroic Fuel Efficiency Service has been left to struggle with the gargantuan task of 'educating' industry towards efficiency as a means of decreasing costs. So somewhere between what the Coal Board is able to deliver in the matter of quality and how the user decides to burn his coal, lies a vast area within which coal is wasted or misused.

Reviewing their performance in 1956, the Coal Board report economy in the use of manpower 'at the face and overall'; output per manshift is the highest ever recorded in the industry's history. Similarly 'substantial progress' was made in the introduction of power-loading machinery—about 35 mill. tons of coal were mechanically loaded during 1956, an increase of nearly 50% over 1955. Also, an intensive effort is being made to improve the speed of shaft sinking and tunnelling. While it is good to hear of this progress, it is not enough; it is well known that capital projects are not moving fast enough so that too much money is tied up unproductively. But the fact that a Reconstruction Department was set up last year to speed up the work involved in the Board's investment programme, shows that the problem is being tackled.

Provided that Sir Percy Mills does in fact step up the atomic energy programme sufficiently to take over where coal stops being sufficient; provided he is not afraid to tread on a few corns in ensuring efficiency of use as well as productivity in the mines; provided he makes certain strong recommendations to the Chancellor of the Exchequer regarding hire purchase and capital projects; provided all those things and many more, we may find ourselves well on the way towards a balanced fuel situation. We shall know within the next few months.

The Other Canals

THE current petrol shortage has given an added edge to the arguments put forward by those in favour of reviving large-scale canal traffic in this country. It is one of our national tragedies that many of these once thriving waterways have fallen into disuse, while others are becoming less busy each year. We have felt that there was a good case to be made out for resuscitating the canals, both for economic and æsthetic reasons, and so we were pleased to note a recent statement by the Inland Waterways Association. In a memorandum to the Committee on Coal Distribution Costs, the Association points out that coal is one of the most suitable commodities for carriage by waterway, provided modern machinery is available for handling it. In 1955, however, 168,008,062 tons of coal was carried by rail, 34,926,715 by road, and only 4,754,114 tons by inland waterways.

In a summary of recommendations, the Association says: 'The predominant need seems to be a recognition of the part water-borne transport can play, the comparatively low utilisation of the waterways system, and the need to review road and rail congestion. We feel that the National Coal Board should reverse its obvious anti-canal policy in certain areas, particularly the Midlands, and issue a decree that the maximum use of canal transport must be made in the future. Such a declaration of policy would give confidence to canal carriers and to owners of water-side premises; certainty of increased traffic would lead to boat building programmes and modernisation of handling equipment. Surcharges discriminating against water borne coal should be abolished. A campaign should be initiated publicising the advantages of water transport for coal and demonstrating the efficiency and economy of modern loading and unloading machinery. . . .' All inland waterways should be placed under the control of a National Waterways Conservancy, it is proposed, and such a body should have conservators representing all waterway interests.

Personal Notes

MR. K. F. HOLLINGSWORTH, Sales Promotion Officer, has been appointed Sales Manager of the Parkinson Stove Co., Ltd. A former employee of the Birmingham Corporation Gas Department, which he joined upon leaving school in 1934, Mr. Hollingsworth holds a Higher Grade Certificate in Gas Engineering (Supply). He left the Birmingham Gas Department in 1950 to join the Parkinson Stove Co., as Junior Representative, and was promoted in 1952 to Midlands Area Manager, and to Sales Promotion Officer in 1955. Mr. Hollingsworth is keenly interested in sport; before leaving the Birmingham Gas Department he served on a number of the recreation committees and captained the Gas Officials Cricket Club from 1947-50. From 1939 to 1945 he served with the First Airborne Division in North Africa, Sicily and Arnhem, where he was wounded—as a result spending eight months as a prisoner-of-war. Consequent upon Mr. Hollingsworth's promotion, MR. ERIC NEWBIGGING, Lecturer to the Parkinson Stove Company, has been appointed Sales Promotion Officer. He will continue to be available for sales and service talks on Parkinson Stove Co., appliances. Mr. Newbigging is a London University Graduate in Economics and a Fellow of the Royal Economic Society. Before joining the Parkinson Stove Company in 1954 he worked for seven years on sales and sales promotion in various parts of the country. From 1941-46 he served with the Royal Air Force in South Africa and on the Continent. A keen debater, he takes an active interest in several local organisations.

MR. A. D. YOUNG, who has just retired after 28 years' service with Newton Chambers & Co., Ltd., Thorncliffe, nr. Sheffield, is extremely well-known in the gas industry, particularly in gasworks managerial circles in the north-west. A technical engineer, as well as a sales representative, many managers have had reason to appreciate his help and counsel. When he became the Newton Chambers representative operating from Manchester in 1930 his work took him to most of the gas plants in Lancashire and the north-west. He contributed much to the designs of many plants. Presentations were made to him at Thorncliffe on his retirement.

MR. A. R. BIRCH has been appointed Manager, meter department, North Thames Gas Board, and Dr. J. L. Mayer has been appointed Medical Officer, Beckton.

MR. G. K. FINDLAY has been appointed Sales Manager of Meters, Ltd. Mr. Findlay joined the Salford Corporation Gas Department in January, 1930, where he remained until 1939. During his war service, Mr. Findlay served in the Directorate of Ordnance Services at the War Office, rising to the rank of major and, in his capacity as A.D.C. to the Director, toured the United States and Canada on a survey of ordnance activities. On demobilisation, Mr. Findlay joined Meters, Ltd., as Commercial Manager at Sawer & Purves and subsequently gained further experience at other branches as well as at head office. During the past two years he has been concentrating on the selling side of the Company's organisation.

Now a Commons Spokesman For Fuel

Mr. Reginald Maudling, 39, has been appointed Paymaster-General in order to represent the new Ministry of Power in the House of Commons. He had been Minister of Supply in Sir Anthony Eden's Government.

Mr. Maudling had been 'tipped' by the political speculators as being earmarked for promotion, and his appointment to an office which is junior to that which he previously held signifies the amount of re-thinking that has been done about the importance of fuel.

Sir Percy Mills and Mr. Maudling will be responsible for the development of the atomic energy programme which will provide fuel for the country's electricity stations.

MR. A. E. V. BUDGE, Group Buyer of the North Thames Gas Board, received a portable radio set from Mr. H. C. Exell, the Board's Controller of Supplies on the occasion of his retirement from the Board's service after 43 years with them. The gift had been subscribed for by Mr. Budge's many friends and colleagues. Mr. Budge started with the former Gas Light and Coke Company in 1913 as an office boy at their Kensal Green gasworks and on the outbreak of war, joined up with the City of London Royal Fusiliers. He saw war service in many countries, and was eventually taken prisoner-of-war. Upon his demobilisation, Mr. Budge resumed work with the Company in their stores department. Since his appointment as Group Buyer some eight years ago, Mr. Budge has been responsible for the ordering and purchase of appliances to the value of some £14 mill. a year.

MR. ARNOLD CARR, Assistant Managing Director of Thos. W. Ward, Ltd., Albion Works, Sheffield, left England by air on January 9 to visit Australia in connection with the Group's activities. He is travelling via the U.S.A., where he will make several business calls, and expects to arrive back in Sheffield about February 22.

MR. J. H. B. LUCAS, Unit Controller for the South Western Gas Board in the Callington and Gunnislake area, has retired after many years service with the gas industry. Mr. Lucas joined the Callington Gas Company in 1907 at the age of 11, his wage being 1s. a week. He was made Manager and Secretary of the Callington Company in 1929, and in 1936 he was made a Director.

DR. W. I. PUMPHREY, Research Manager of Murex Welding Processes, Ltd., Waltham Cross, Herts., has been awarded the degree of D.Sc. in Industrial Metallurgy by the University of Birmingham for his work on hardenability, the transformation of steel during continuous cooling and the metallurgy of welding.

Obituary

MR. HENRY LANGLEY BATEMAN, aged 64, who retired from the position of Engineer and Manager of Dewsbury and Ossett District of the North Eastern Gas Board at the beginning of December, was found dead in his car at Midgley, near Wakefield, on January 8. Mr. Bateman, who was still retained in a consultative capacity by the North Eastern Gas Board, went to Dewsbury in 1924, when he succeeded Mr. G. W. Fligg as Manager of the gas undertaking of Dewsbury Corporation. Previously he had been at Wakefield and had been in the gas industry for 47 years. Under his control the Dewsbury gasworks were considerably enlarged and modernised. On nationalisation, Mr. Bateman, joining the North Eastern Gas Board, continued his work for the modernisation of the Dewsbury gas undertaking and he also played a big part in reorganising the gas works at Ossett.

MR. J. E. LISTER COOPER, widely known in the gas industry, collapsed and died while waiting for a bus to Harrogate where he had lived since 1950. Mr. Cooper was Engineer, Manager and Secretary of Yeadon and Guiseley Gas Company and a Director from 1932 until the nationalisation of the gas industry. For 16 years he was Secretary of the Yorkshire Section of Gas Undertakings, Secretary of the Yorkshire Section, National Gas Council, Secretary of the Yorkshire Section, Federation of Gas Employers, Employers' Secretary of the Regional Joint Industrial Council, Secretary of the Yorkshire Tar Producers, and for seven years Yorkshire representative on the national body of the gas industry. He was also a former Director of Elland, Otley, and Pudsey Gas Companies. Mr. Cooper, who was 73, leaves a widow, two sons and three daughters.

SIR HAROLD SEES BOARD AT WORK

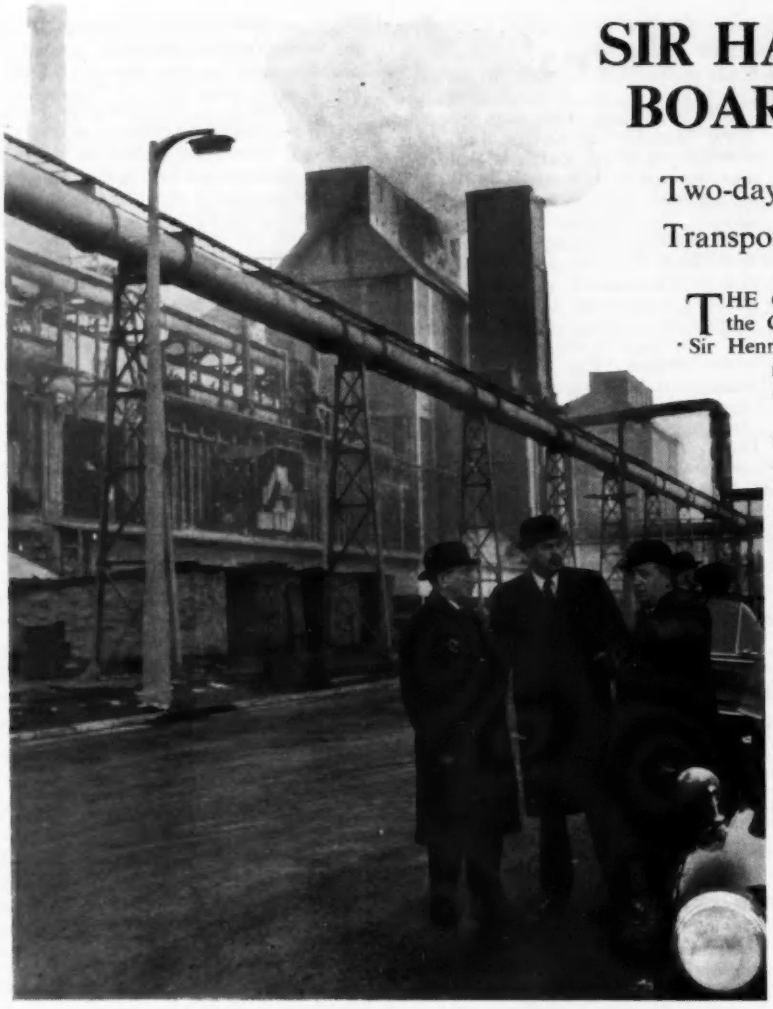
Two-day Tour Covered Works, Transport, Service and Testing

THE Chairman and Deputy Chairman of the Gas Council, Sir Harold Smith and Sir Henry Jones, visited some of the departments of the North Thames Gas Board on January 3 and 4.

They were accompanied at various stages of the tour by the Chairman of the Board and officials, including the Secretary, Mr. Brian Wood, the Chief Engineer, Dr. J. Burns, and the Deputy Chief Engineer, Mr. J. A. Hepworth.

On the first day the party saw Beckton gasworks, the Station Engineer of which is Mr. H. Bradley, and the products works (Controller of By-products, Mr. L. W. Blundell). After lunch at the welfare centre, they left for the Stratford Divisional warehouse, inspecting specialised vehicles. Present were: Mr. S. G. Aberdein, Commercial Manager, Mr. T. V. Garrud, Controller of Services, Mr. J. A. Buckley, Divisional Manager, Eastern Division, Mr. E. S. Caplin, Transport Manager, and Mr. W. J. R. Waterfield, Station Engineer, Stratford.

The following day the Service Section at Westminster, the Testing Laboratory at Brentford and the G.I. plant at Kensal Green were visited.



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Above left: *Sir Harold Smith, Mr. Michael Milne-Watson and Dr. J. Burns are seen in 'coke oven alley' at Beckton.*

Below left: *The main party is seen entering the main control platform of the modern water treatment plant—a feature of the new steam and power installation at the products works. On the left is seen a modern instrument panel on which is centralised all the controls of the plant.*

Below right: *Seen under construction are the butane pressure tanks, each of which will be capable of containing 5 mill. cu.ft. of peak load gas.*

During 1956 W-D were 'on site' building for the Gas, Coal and Steel Industries

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★ BECKTON (LONDON) I
✓▲ BECKTON (LONDON) IV
✓● BIRMINGHAM, NECHELLS III
● BIRMINGHAM, SALTLEY I
✓● BIRMINGHAM, WINDSOR STREET III
✓● BOLTON II
✓● BRADFORD II
✓● BRISTOL
▲ B.C.R.A. TEST OVEN (CHESTERFIELD)
● BURTON-ON-TRENT
■ CAMBRIDGE III
★ CARDIFF I
✓■ CHRISTCHURCH, NEW ZEALAND
✓● DONCASTER
■ DOVER II
■ EAST COWES
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▲ GLASSHOUGHTON (YORKS)
■ GLOUCESTER OIL GASIFICATION
■ GLOUCESTER COMPLETE GASIFICATION
✓■ GLOUCESTER GAS TRANSFORMATION
● HILSEA
● HINCKLEY
■ HUDDERSFIELD II
● HULL
✓● IPSWICH II
▲ IRLAM (MANCHESTER) IV
■ LANCASTER, WHITE LUND
✓● LINCOLN II
✓● LONDON, BOW COMMON
✓● LONDON, WANDSWORTH III
★ LYSAGHT (SCUNTHORPE) I
✓▲ MONKTON (DURHAM) II
▲ MOSS BAY (WORKINGTON) III
▲ MURTON (DURHAM)
● NEWQUAY I & II
● NEWTON-ON-AYR
✓● NOTTINGHAM I
✓● NOTTINGHAM IV
● OLDHAM
▲ ORGREAVE (SHEFFIELD) IV
✓● PAISLEY II
✓● PETERBOROUGH II
✓● PONDERS END
✓● PRESCOT
▲ PRETORIA, SOUTH AFRICA V
▲ PRETORIA, SOUTH AFRICA VI
▲ RANDOLPH (DURHAM) II
▲ RAVENSCRAIG (MOTHERWELL)
● READING
■ ROTHERHAM II
● SOUTHAMPTON
✓● STOCKPORT III
■ TRURO
▲ VANDERBIJL PARK, SOUTH AFRICA II
■ WALSALL II
✓● WARRINGTON VI
● WELLINGTON IV & V
● WESTON-SUPER-MARE
✓● WOLVERHAMPTON II

■ *Gasmaking Plants (New)*
● *Gasmaking Plants (Reconstructions and Major Repairs)*
▲ *Coke Oven Plants (New)*
★ *Coke Oven Plants (Rebuilds)*
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Rush of Housewives Closed Down Glasgow Icing Offer

SO many Glasgow housewives rushed to take advantage of a special offer by the Scottish Gas Board that the concession had to be hurriedly brought to an end a week ahead of time.

The story was told by Miss Shiela Macdonald, one of the Glasgow home service advisers, when she addressed the members of the Western Scotland Junior Gas Association at their January meeting in Glasgow.

Just before Christmas, she explained, the Glasgow home service advisers tried a new venture—the free icing of Christmas cakes. 'This was received by the public with almost alarming results,' she said. 'The offer was supposed to be open for ten days, but by the third day—so many cakes had been handed in—we had to close it. We finished up by icing more than 400 cakes in nine days. It was a most successful experiment.'

Miss Macdonald remarked that the home service adviser's life was a varied and interesting one—of some service to the public and to the Gas Board. She detailed the course of training of the potential home service adviser—at least two years in a domestic science college learning home management, and a further period of training under the Scottish Gas Board learning something of the industry and its appliances, how to demonstrate and sell, run small exhibitions, and judge cookery contests.

Miss Macdonald was the first woman ever to address the Western Juniors, and the experiment of a 'Ladies' Night' was made in the hope of arresting dwindling attendances. The turn-out for the meeting still left very much to be desired, but those present heard an interesting and refreshing informal talk.

Diary

January 25.—INSTITUTION OF CHEMICAL ENGINEERS, NORTH WESTERN BRANCH: The Grand Hotel, Manchester, 3.30 p.m. Annual General Meeting.

January 26. — YORKSHIRE JUNIORS: Harrogate. 2.30 p.m. Short Paper Day.

MANAGER IMPORTS £1,000 OF THOSE BOBS FOR THE GAS

A SHILLING famine which hits Monmouthshire every Christmastime was more acute this year than ever.

It was so bad, Mr. A. H. Dyer, Manager and Engineer, of the Newport undertaking of the Wales Gas Board told Newport Chamber of Trade, that he had to 'import' £1,000 worth of the coins from other areas to issue to anxious housewives.

But Mr. Dyer disputed a suggestion that the shortage was due to lack of foresight by the gas and electricity undertakings in not arranging to clear meters at the beginning of December.

He pointed out that meter collection did not start at any particular time but was going on continuously throughout each quarter.

Mr. Dyer said he could not understand why shillings vanished at Christmastime but gave an assurance that it 'will not happen again.'

Record Output at Pontypool

UNION MEMBERS THANKED

DURING the first week of the year, one day's output by the Pontypool undertaking of the Wales Gas Board was the highest produced in any period of 24 hours since the plant came into operation in 1949.

This was revealed recently by Mr. A. Facer, General Manager, when he spoke at the annual dinner of the Pontypool gas and water welfare club. Mr. Facer said that during that day 4½ mill. cu.ft. of gas was produced.

He added that recently a large proportion of the plant was repaired, and thanked the trade union members for their support in overcoming labour difficulties during the repair period.

The undertaking had now been called upon to produce the maximum amount of gas to assist industrialists in overcoming difficulties created by the oil situation.

Mr. Facer also referred to experiments carried out during the summer with a view to increasing plant efficiency and flexibility, and to the fact that the undertaking had been asked to lay a gas grid main from Abergavenny to Brecon, which would form an extension of the South Wales grid.

About 110 employees attended the dinner. Mr. G. V. Davies, chairman of the welfare club, presided, and Mr. A. Timms was M.C. for the dance which followed.

'Britain's Biggest Coking Plant'

In our report on p. 79, January 9, we stated that the second half of the new coke-oven and by-product plant by Simon-Carves, Ltd., for Dorman Long (Steel), Ltd., at South Bank, Middlesbrough, was 'expected to go into service early next year.' This should have read 'early *this* year.'

POTENTIAL . . .

THE boys on the left are watching an apprentice on the stand sponsored by the Eastern, South Eastern and North Thames Gas Boards at the Schoolboy's Exhibition which ended recently. The three young men with Mr. H. W. Moys (below) have already 'had a go.' They are star apprentices with the North Thames Board receiving the 'William Dieterichs' Memorial Prize.

. . . GAS MEN

THE BREEZE PROBLEM

By A. R. MYHILL,
F.R.I.C., M.Inst.Gas E., M.Inst.F.

THE term 'breeze' is one which is still rather loosely applied, despite various suggestions for standardisation. The British Standard definiton is given as 'coke of small size, often containing fine particles.' In the present article, 'small size' is taken to mean that which will pass through a $\frac{1}{2}$ in. square mesh, and, since the presence of finer particles down to dust size often has a considerable influence on its utilisation, special reference is made to cases where the very small sizes, say, below $\frac{3}{16}$ in., have been removed before use.

The choice of breeze as a fuel, either on the gasworks or by outside consumers, is probably made in every case, solely on considerations of price per ton, which is generally about one-third of that obtainable for graded coke, although this ratio may vary considerably in special instances. There is no doubt that, if closely graded coke could be obtained at the same price as breeze, the latter would never be used as a fuel. Nevertheless, the very great difference in cost will often justify its use in preference to coke, but in order to obtain the maximum efficiency of utilisation, combined with minimum disadvantages, it generally become necessary to use special types of plant and to adopt special operating techniques.

Since the cost of gas manufacture is dependent so largely on the revenue obtainable from coke, it is important to make every effort to release for sale the greatest possible amount of the higher-priced grades, and this can be done by limiting the quantities of such grades which are consumed on the gasworks. Where it is practicable and efficient to use breeze and fines in this connection, therefore, this should be done. If, in addition, operating and handling conditions, and the type of coal and plant used can be so combined as to produce the minimum proportion of the smaller sizes, a further financial gain can be realised. This favourable combination of circumstances is not always easy to realise in practice, since the production of a free-burning coke often depends on those properties which favour disintegration in handling. It will therefore be instructive to consider the circumstances which affect the amount of breeze produced with the coke. This proportion, obviously very variable, may reasonably be taken as about 15% of the total. The factors controlling the quantity are many, and, to a large extent, interrelated. They include coal characteristics, carbonising system, methods of quenching, screening, handling, and transport.

Importance of Coal Characteristics

In the production of coke, coal characteristics are closely related to the system of carbonisation, since the behaviour of coal on heating will depend very largely on the conditions prevailing in the retort. For example, a high Swelling Index of the coal is often associated with the production of large and closely grained coke which is mechanically strong, and, therefore, accompanied by a relatively small proportion of breeze. This is not always the case, however, since the formation of this type of coke from a highly swelling coal is generally the outcome of restraint put on the coal by lack of room for expansion within the carbonising chamber. Coals of this type, on heating, attain a semi-fluid condition in which they possess considerable plasticity, so that when restrictions are imposed, the material is compressed and becomes compacted by the forced entry of the fluid substance into the voids of the solid portion. With further increase of temperature, plasticity is destroyed as more gas is produced, and the residual coke is hardened, often with a certain amount of graphitisation.

Such conditions represent the state of affairs which prevail to the maximum degree in horizontal retorts which are well-filled, in coke ovens, and in static vertical chambers. If a highly swelling coal is carbonised in a horizontal retort using very light charges, however, so that there is plenty of unrestricted space to allow the natural swelling to take place, a very porous coke will be produced, which is often mechanically weak and which may easily break up during quenching and handling, so that a considerable quantity of breeze may be expected.

In a continuous vertical retort, successful carbonisation of moderately high-swelling coals can be carried out provided the internal outward taper of the chamber walls is properly proportioned to avoid 'holding up' by swelling. The continuous downward movement of the charge allows a considerable amount of swelling to take place without undue compression, and the resulting coke is therefore more porous, more reactive, and more combustible than that made in the static systems. Additional porosity is produced, both in continuous and intermittent verticals, when steaming of the charge is practised, and high steaming is likely to be productive of a high breeze content in the coke. This is particularly the case with low-swelling coals which, by reason of lack of agglutinants, are likely to form cokes of low coherence. On this account it is often advantageous to carbonise mixtures of low and high swelling coals, the lack of agglutinant in the former being supplied by the excess in the latter. In static carbonising systems there will be less breeze than in continuous systems, not only because of the greater compression, but also because of the absence of an extractor mechanism which may contribute to the breaking up of the coke.

Coal size has a bearing on the strength of the coke, particularly with high swelling types. In such cases small coal gives a more compact coke than large coal.

High carbonising temperatures or long standing in static retorts gives hard coke, but, although this may reduce the quantity of breeze, the real ignitability and combustibility of the product are reduced.

Coals which have been in storage for several years, particularly if the temperature in the stack has been allowed to rise above about 25°C., a not uncommon circumstance, will produce coke containing an excessive proportion of breeze, often rising to 50-60% of the total.

It is, however, at stages after the coke has left the retort that most of the breeze is produced. Factors operating in this connection include quenching, transport from the retort house, stocking, screening, and transport to outside consumers.

Continuous vertical retorts offer the most advantageous form of quenching. This takes place mainly by the action of steam in the lower part of the retort before the coke reaches the extractor. In cases where the proportion of steam admitted for water gas production is insufficient for the complete cooling of the coke, water sprays are provided in the coke chamber itself, the coke being discharged at, say, 100-150°C., so that no external plant is required for dealing with red-hot coke.

Hot Coke Quenching

With static methods of carbonisation, hot coke quenching can be carried out by either wet or dry cooling. In general, dry cooling methods are to be preferred, since the coke is subjected much less to disrupting shock than when water is used. Dry cooling systems, moreover, are designed to conserve a considerable proportion of the heat of the hot coke. If wet quenching is carried out, some of the cruder methods sometimes practised in horizontal retort installations, such as indiscriminate use of a hose pipe, or even submergence in a tank of water, must be definitely avoided. The careful regulation of the quantity and mode of application of cooling water, such as is practised in the cooling tower and Le Fleuve systems, are examples of reasonably good wet-cooling procedure, but for the production of the minimum amount of breeze from static chambers, dry-cooling methods are generally to be preferred, although in some cases the dust problem may create a nuisance, so that mild water spraying may be found to be necessary at a later stage.

A considerable amount of breakage always occurs in the transport of coke from one part of the works to another, as from retorts to screening plant, storage hoppers or to consumers' premises for cold coke, rubber belt conveyors have great advantages over tipping-tray, drag-bar or bucket conveyors.

Chutes between belts, or feeding to screens should be

designed to slide the coke smoothly. The best lining medium is smooth, hard-burnt earthenware, although this will disintegrate after a period of continuous impact. The direct falling of coke from a height should be avoided wherever possible, and breakage can be minimised by the provision of spiral chutes, which have the advantage of taking up less ground space than straight chutes. Where practicable, deep falls of coke may be avoided by the frequent 'topping-up' of large bunkers rather than allowing the latter to become nearly empty before re-filling.

Breakage during screening will be influenced by the type of screening plant used, the rate at which screening is carried out, and the degree of loading of the screens.

The question of coke-cutting is allied to screening, and it must always be remembered that cutting produces considerable quantities of breeze. There may be occasions when it is economical to cut the larger sizes, as, for example, when domestic coke is in good demand, but if the demand can be satisfied by simple screening, it should be considered as an alternative.

Disadvantages of Breeze

The disadvantages of breeze as a fuel are related to: (a) Smallness of size; (b) ash content; (c) moisture content. With a solid fuel of small particle size, trouble is often experienced in attempts successfully to gasify or burn the material. This is especially the case when using mixtures of breeze and dust, when segregation will accentuate the troubles. The principal difficulties arise on account of irregularity of gas-, air-, or steam-flow through the fuel bed, and it often becomes necessary to use special appliances or techniques.

The closeness of packing of the fines imposes a resistance to flow, and eventually leads to 'rat-holing,' in which channels develop, and short-circuiting takes place. This leads to abrupt changes in rate of burning or production of gas, as well as to irregularity in the composition of gas made.

Carry-over of fine particles, whether in boiler furnaces or gas producers, results in loss of combustibles in fuel, partial blockage of ducts, and troubles arising from corrosive or abrasive effects of dust on refractories.

The ash content of coke and breeze produced by screening run-of-retort coke increases as the graded sections become smaller in piece-size. This also applies to the proportion of moisture, especially when the material has been wet-quenched. The following figures may be taken as typical.

Size	Over 2½ in.	2½in-1¼in.	1¼in.-⅝in.	⅝in.-$\frac{3}{16}$in.	Below $\frac{3}{16}$in.
% Ash (D.B.) ..	7	9	12	14	19
% H_2O	2	4	13	16	20

Where there is a high proportion of moisture in the fine gradings, an additional disadvantage arises, since this often makes it impracticable to screen out the dust from the breeze, so that, in practice, all the material below about ¼ in. has to be sold or used, containing dust. This is far from satisfactory, particularly if the quantities are large, since boiler grates, producers, and other equipment can often deal with small screened breeze much more satisfactorily than with material containing even a comparatively small amount of dust, especially if the latter is wet. Some makers claim that vibrating screens can deal with moist breeze satisfactorily, so that material below ¼ in. can be screened out. Where this claim is substantiated by practical experience, advantage should be taken of it.

Since ash and moisture are inerts, their effect will be to reduce gas yields and calorific value contribution in inverse ratio to their quantities, and this must, of course, be taken into consideration in the design and operation of plant used to consume the material. There are, however, other factors which are related to the consumption of high-ash fuels in producers and on boiler grates. These are connected with clinker trouble. The liability of this kind of trouble to occur depends probably more on the composition of the ash (with its relation to the fusion point) than on its quantity, but, obviously, the lower the proportion of ash, the less will be the liability to encounter clinker troubles. A high ash content is likely to accentuate the disadvantages of irregular rates of consumption which are well known features of gasifying or burning fine material.

Since breeze, in greater or smaller amounts, is a necessary accompaniment to carbonising practice, it is important to consider methods for its economic disposal. It may be used either as fuel on the gasworks itself, thus releasing for sale a corresponding amount of the higher priced coke grades, or it may be sold to outside consumers at a relatively low price. The price which the consumer is willing to pay will depend on a balanced consideration of any disadvantages attendant on the use of the material, and the price which he would have to pay for a higher quality fuel. It is, therefore, a great advantage to encourage close co-operation between the gas undertaking, the consumer, and the makers of plant and appliances, to ensure that the fuel is used to the maximum efficiency.

The principal outlets for breeze are its use in gas producers, either for retort heating, or for dilution, and on boiler grates for steam raising. A certain amount is also used in factories for forging, welding, and metallurgical furnaces. Its use for making water gas has been considered, but, so far, this application has not been found to give general satisfaction.

The manufacture of briquettes by incorporating with pitch and stamping in a press, has been practised with a certain measure of success[2] and the product can be used as a domestic fuel, for boilers, and for gas producers, but the briquettes often have the disadvantage that they break up shortly after combustion has started, and segregation occurs, which leads to irregular burning. Experiments are still in progress with the object of overcoming this.

Harris[3] has shown that, under suitable conditions it is possible to reduce the 'net' amount of breeze made, by screening over $\frac{3}{16}$ in. mesh and mixing the fines with medium or highly swelling slack coal. The mixture is carbonised in continuous or intermittent vertical retorts, or in horizontals, with the production of a reasonably strong coke of saleable size-grading.

Use of Breeze for Gas Producers

Producers designed to gasify either coke or breeze may be manually or mechanically operated. Manually operated producers are now represented by the step-grate type, and, although these have been designed for many years past in a form suitable for breeze burning, they can never be looked upon as being really dependable when using fuel consisting of, or containing a large proportion of fine material. Manually operated producers in gasworks practice are rapidly becoming obsolescent except for very small works, and will doubtless eventually be entirely replaced by those of the mechanically operated type when the integration policy of the nationalised industry becomes fully implemented.

Whether producers are manually or mechanically operated and whatever the type of fuel, particles below $\frac{3}{16}$ in. should be screened out where this is practicable. Certain makes of producer, particularly mechanical, are sometimes claimed as being capable of dealing with dust, but experience has proved that this should be avoided wherever possible.

It is not generally possible to generate all the producer gas necessary for retort heating from breeze alone, since the total quantity of breeze produced may be only, say, 15% of the coke, while the fuel consumption may amount to about 25% of the coke. It is, therefore, necessary to use also the larger sizes to make producer gas, and this is generally supplied as run-of-retort-house coke. Since a producer of any kind works best with fuel of sizes within a limited range, it is not a good policy to mix breeze with large coke of varying or screened sizes. It is better to keep certain producers for run-of-retort or screened coke, and to use others, to the maximum practical capacity, for breeze. Conditions of control will be different in the two cases in order to obtain the best results, and should be so regulated that each producer is working to maximum efficiency and output on its particular fuel. Such conditions include air and steam rates, clinkering time rota, gas pressures and other factors.

Where it is the practice (as when there is only one producer at work) to use a mixture of graded coke and breeze, the mixture should be as regular as possible.

The two fuels should not be stored in a common bunker on account of the considerable amount of segregation which can take place. The two sizes should be stored in separate hoppers, and arrangements made to deliver proportionate quantities from each when charging the producer in a manner which allows of even mixing.

Mechanically-operated producers designed for breeze burning are now in common use. These are constructed with rotating grates which obviate the necessity for manual clinkering. Some makes are also provided with automatic feeding devices.

Mechanically operated producers may be classified into two types, according to whether they deliver hot gas direct to the point of consumption, or whether they deliver cold gas which has been cleaned from dust and water-washed.

In a hot-gas producer there is the advantage that the sensible heat, in addition to the potential, or calorific value heat, is conserved, and there is, of course, a correspondingly higher thermal efficiency of gas production. On the other hand, it is not possible to remove all the dust which is carried by the gas at the temperature of operation, and this may bring about the well known troubles of partial blockage of flues and corrosion of refractories.

West's hot-gas producer is an example of a type used for burning breeze for heating retort settings. Partial removal of dust is incorporated in the plant, and, since the dust extractor deals with the hot gas, very little of the sensible heat is removed. The dust so removed can be taken away without interfering with the working of the producer. The reaction zone is surrounded by a water jacket in which sufficient steam is generated at low pressure for blast saturation.[4]

The Cold Gas Producer

In many instances, modern practice favours the cold gas producer, especially when a piping system is used to deliver the gas to more or less remote situations, as, for instance for dilution of coal gas in the foul main, in which case a meter may be incorporated in the pipe line, or the gas may be delivered to a holder. Considerable advance has been made in the construction of producer plant in this connection, and a large proportion of the heat which would otherwise be lost from the gas is recovered in the form of steam generated in the annular boiler, the provision of which, incidentally, minimises clinker formation. Advantage is taken at all stages, of mechanical and automatic operations such as fuel feeding, ash removal and control of the temperature and pressure of the gas and air blast.

The Power-Gas Corporation's installation of producers utilizing coke breeze at the Sydenham works of the South Eastern Gas Board represents a typical example of this type of equipment. Previous to its adoption, breeze had been used in two Trefois mechanical producers provided with a simple form of gas-washing plant. The installation worked reliably for 10-12 years, and was used for heating horizontal retort settings. It was not possible, however, to work successfully unless material below $\frac{3}{16}$ in. had been screened out, and, although this is still considered to be common experience with mechanical producers, it was decided to make attempts to overcome this disadvantage when replacement of the plant became necessary. In a later installation, constructed by the Power-Gas Corporation, specially designed fuel-feed arrangements were incorporated, designed to minimise the segregation of the various breeze and dust fractions.

The installation has now been in continuous use for several years, producing gas for dilution of coal gas and for heating retort settings, from breeze passing through $\frac{1}{4}$ in. mesh and containing all the fines down to dust.

The fuel is contained in two 10-ton hoppers, one to each producer, and is fed to the generators by means of an adjustable distributor capable of being raised or lowered to suit the fuel used, and is comprised of a central opening with 12 radial chutes, ensuring that fuel is distributed without segregation to all parts of the fuel bed. The breeze is fed to the distributor from a small closed hopper located between the main overhead hopper and the producer. This small hopper is fitted with an interlocking feed valve, and the fuel contained in it forms a continuous column to the producer. An electrically operated feed valve ensures that the fuel is kept in motion, and actuates an alarm to warn the operator when re-charging is necessary. The feed valve is then locked, and the fuel hopper re-charged manually from the main fuel bunker.

Mechanical extraction of ash and clinker is by hydraulic operation, using oil as the medium. The grate is rotated by means of a thruster, operated on a ratchet driving ring, the ash and clinker being ejected by coming into contact with adjustable plates set at an angle in the space between the generator and the outer plates of the water seal.[5]

There is seldom any justification for using good coke for steam raising in gas works practice. Much of the base load steam produced on the works, either for steaming in vertical retorts, for water gas making or for producers, is now supplied by waste-heat recovery from boilers operating integrally with the gas-making plant. The modern appreciation of the economy and convenience of electrical drives for pumps, exhausters, boosters, and other steam-using equipment has led to a general reduction in steam requirements. Where additional base-load steam is required, it is generally economical to instal special breeze-burning boilers.[6] Ordinary Lancashire and Economic type boilers can be satisfactorily used provided they are fitted with chain grate stokers of appropriate design. Danks (Oldbury) Ltd. have specialised in this type of plant, and Lancashire boilers using chain grates are now in operation in many gas works, using fuel which was, at one time regarded as very unsatisfactory for steam raising.

The stoker grate consists of an endless chain of short cast iron links, connected by rods, and driven by sprockets mounted on a shaft in the front part of the machine. Air spaces between the links allow of even distribution of the blast. The fuel is fed to the grate from a hopper mounted on the boiler front, and the full depth is controlled by a refractory-lined fire-door which is capable of vertical movement. A special patented air duct (not normally fitted to grates for burning coal or screened coke) is incorporated in the setting for assisting in burning the fine material.

Independent air control is provided at the front and rear of the grate to allow adjustments to be made for burning different grades of fuel and for different fuel depths. The air is supplied by forced draught.

Cast iron ash plates are fitted at the chimney end of the grate for the removal of ash, which falls over the end into a chamber below the grate, from which it can be removed by means of a long-handled shovel.

Provision is made, by means of a so-called 'soot-blower,' for the periodical removal of dust from the flues. Owing to the fineness and high ash content of the fuel a fairly large amount of such dust is liable to be carried forward, and this is blown, by special nozzles, in such a direction that it collects in pits, from which it is removed by suction

John Thompson Water Tube Boilers, Ltd., have developed a special down-draught system of burning breeze which has marked advantages in cases where the material is heavily laden with moisture.

In some boiler furnaces prior to the development of this system, wet fuel was subjected to a preliminary drying process on the grate itself, through the design of the furnace chamber, the refractory arches of which were so arranged as to promote circulation of hot gases within the chamber, over the surface of the fuel. This condition, with the aid of radiant heat from the refractory walls, promotes the drying and ignition of the fuel. Such devices, however, are often only partially satisfactory on account of the insufficient heat penetration of the fuel bed by the hot gases, so that the heavier concentrations of moisture are not completely removed, and combustion is incomplete and fuel is wasted.

In the new system, complete penetration of the fuel bed is accomplished by induced down-draught, which operates through a compartment located immediately beneath the particular area of the grate upon which the moist fuel is fed. This down-draught compartment is connected by ducts to a suction fan which induces a degree of down-draught sufficient to draw hot gases which are flowing over the fuel bed within the furnace towards, and finally through the bed of moist fuel. By the time the fuel enters the main combustion zone it has become completely dry, pre-heated and ignited, and in such a condition that maximum combustion efficiency is realised. Since the condition of the raw fuel may vary from time to time, provision is made for regulating the amount of down-draught allowed to pass over and through the bed.

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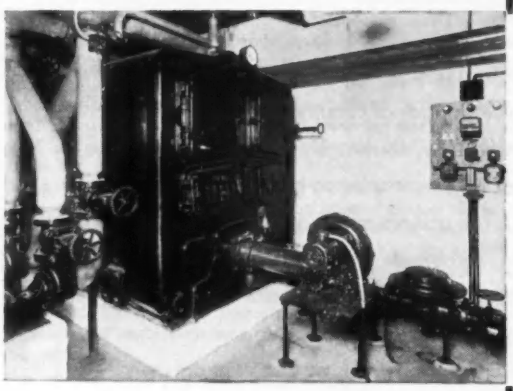

A central heating boiler equipped with the Gako forced draught burner unit.

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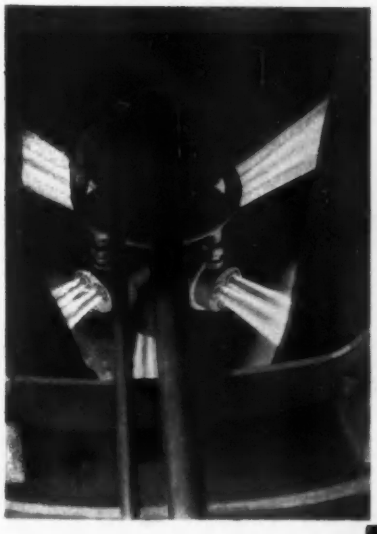

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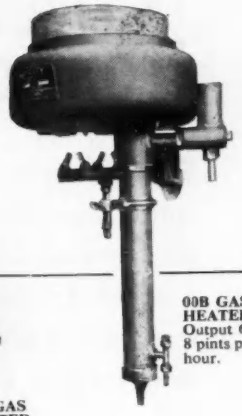

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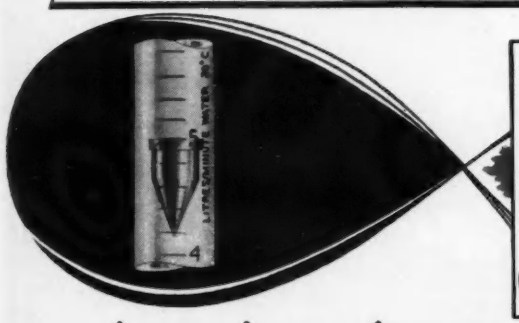

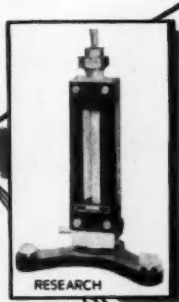

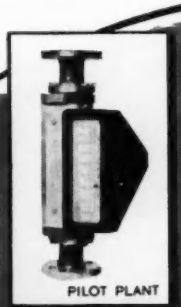

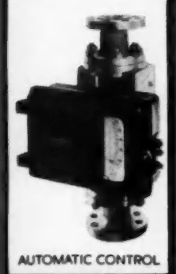

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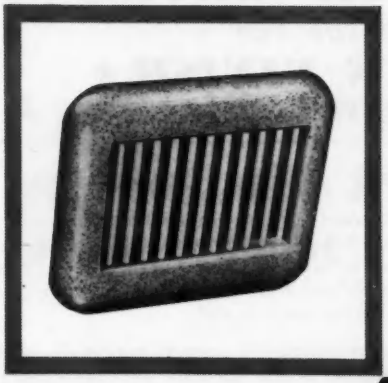

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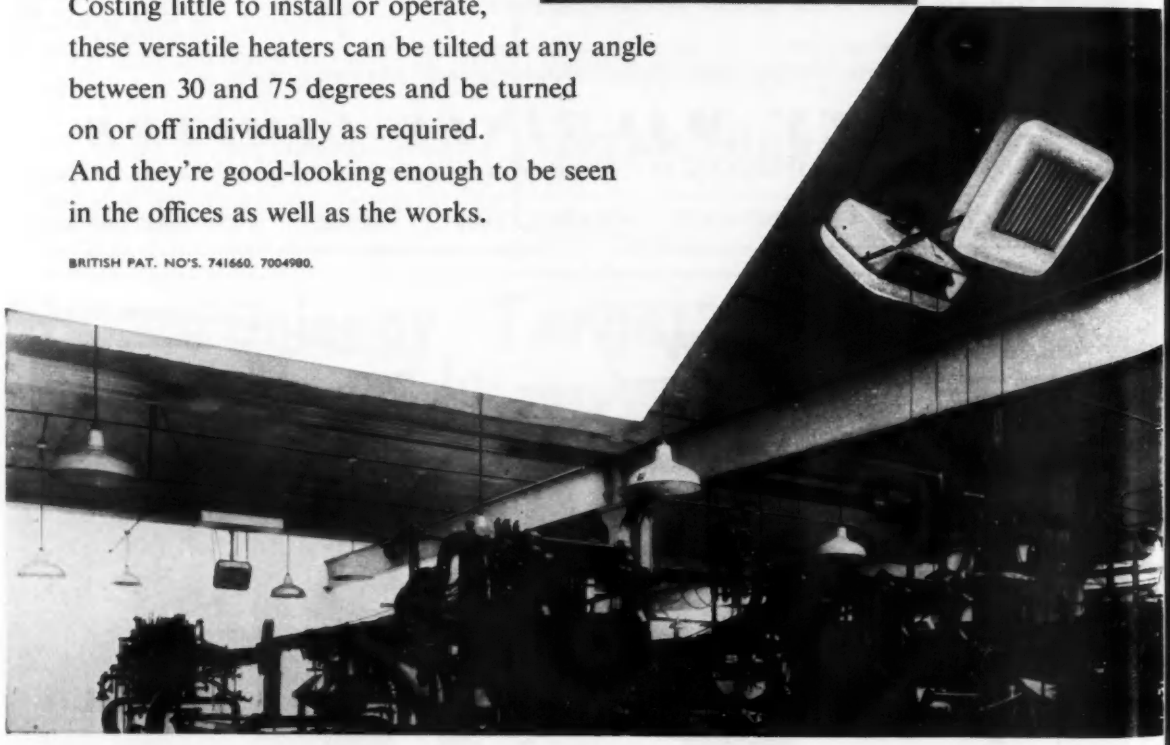

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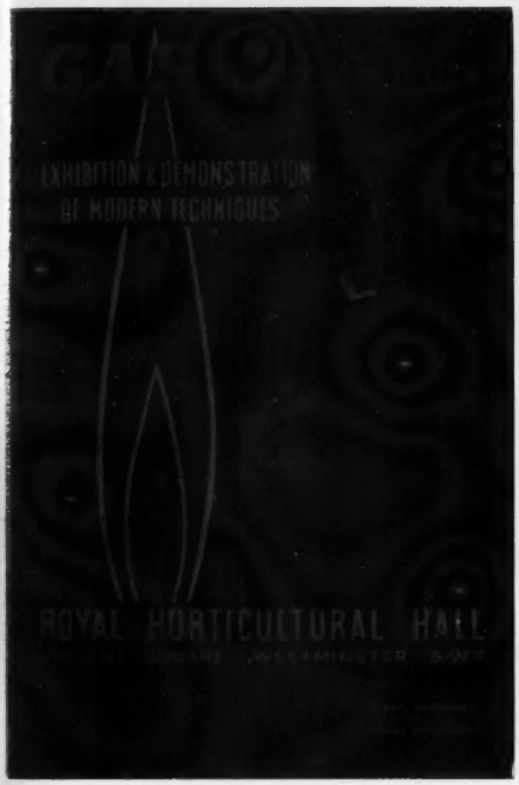
GAS at work in industry



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January 22 - February 2

THE accumulated wealth of the gas engineer's contribution, over the years, to the solving of industrial heating problems is gathered together in Britain's first-ever Exhibition of Gas at Work in Industry, which opened in London yesterday, at the Royal Horticultural Hall, Westminster.

This splendid undertaking was devised and planned to show the industrialist, in consultation with the industrial gas engineer, how the fuel can be adapted to the processes of his manufacture and made to improve his existing arrangements. With this aim in view the stands are arranged in terms of industrial processes rather than along the usual lines where the layout is determined by consideration of the equipment on display.

Efficiency and automatic processing are the keynotes of the exhibition, and the way in which gas is keeping to the fore in a rapidly changing and highly competitive field is ably demonstrated. It seems reasonable to predict that by the time it ends on February 2 this excellent exhibition will have achieved its purpose and amply repaid the great amount of hard work which has gone into its organisation by the Industrial Gas Officers of the North Thames, South Eastern, Eastern, and Southern Gas Boards.

Review of the Exhibition

FLAME PROCESSING

ONE of the most important applications of gas in industry, and one for which a steadily expanding future is assured, is in processes involving the direct use of flame. Its flexibility and extreme ease of control give gas unique advantages in this field, and gas flames are already extensively used for such diverse purposes as the singeing of fabrics, the drying of paper, and the tempering of wire on the one hand, and the cutting of such materials as 60-in.-deep metal castings and forged steel components of, for example, 24 in. by 43 in. section, on the other (and it is worth mentioning that the last-named operation is performed in 12 minutes!)

Beagle transportable gas profile cutting machine by British Oxygen Gases Ltd.

Clean and Accurate

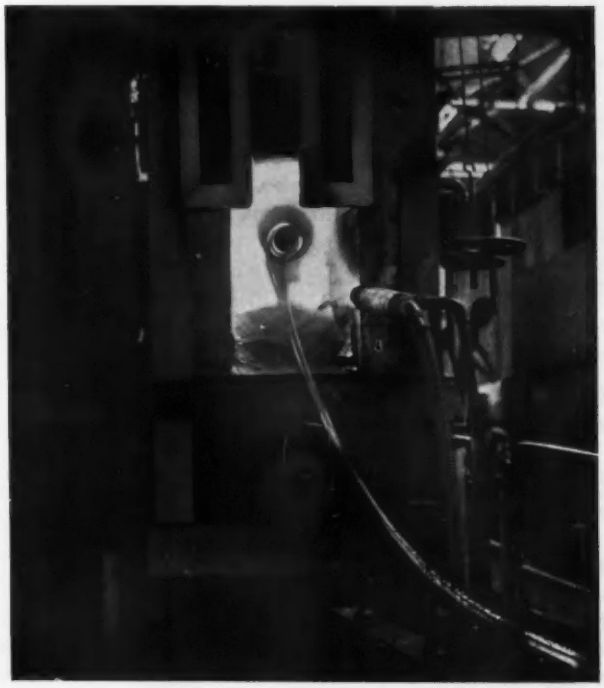
Many of these applications of gas in industry are demonstrated on stand L of the exhibition. Among equipment seen in operation is a profile cutting machine of the British Oxygen Co. Ltd. Machines such as this greatly reduce machining times, giving an exceptionally clean and accurate cut—indeed, machining can often be eliminated. Development has reached a point where, in addition, a wide variety of shapes can now be profiled without the use of templates. The saving of time, labour, capital costs, and overheads which is thus offered to industrialists is obvious.

Also seen in operation on this stand are a rotary auto brazer and an example of the recently developed G100 electro/gas brazing machine (Stanelco), both products of Standard Telephones and Cables, Ltd., and both equipped with electronic timing control.

This use of electronics is also seen in action in a Peddinghaus MWA flame hardening unit by Surfard, Ltd. Of German origin, this technique has now been mastered in this country, and offers many advantages, not least of which is that satisfactory results may be obtained with lower quality steels than could be used with conventional pack hardening methods.

In this unit, a photo-electric cell compares the radiation reaching it from the surface being treated with that from a pre-set filament, and produces signals which, amplified and applied to relays, provide automatic control of the whole process. Not only does this eliminate risk of error due to the human element, but also saves time, labour and machining. Other advantages of this technique are that only that part of the metal which it is desired to treat is hardened, and distortion is reduced to a minimum.

Another interesting piece of equipment on this stand, though not seen in operation, is a metal spraying unit by Schori Matallising Processes, Ltd. Provision of a metal surface film by spraying metal powders is achieved by feeding the powder under speed through a zone of intense heat provided by the gas burner, whence the particles are carried on at high velocity to the surface being treated.



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Glass is fed over a mandrel to form tubing for electric lamps. Accurate heating is vital.

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GLASS WORKING

SIMILAR use of flame for very different manufacturing processes is seen on stand M which is devoted to glass working. This again is a most important field from the point of view of the gas industry and is already a very large consumer. Gas is used in quantity in every stage of glass production, from the melting of the raw materials, through an almost endless variety of processes ranging from the simple to the most delicate and intricate, to the annealing of the finished article in the lehr (not forgetting the glory hole as the high temperature furnace for quick reheating of articles requiring further processing is rather delightfully called.)

Inventive Genius

On this stand, the General Electric Co. Ltd. have a flange and a bulb blowing machine, while Pearlray Signs give a demonstration of hand glass blowing which cannot fail to impress the visitor who has never seen this craft performed before. However, the inventive genius which has gone into the development of the modern electric bulb and valve

THE SHELL MOULDING PROCESS

These four illustrations show key stages in the recently developed shell moulding process. Above, the shell is seen after curing. The pattern pre-heating and shell curing chambers, situated side by side, are almost identical, and are heated by accurately located gas burners. The process is circuitous in form, thus reducing to a minimum movement of operators and materials. The second picture shows the shell being removed from the pattern plate, while in the third, shells and cores are seen being assembled. Below, stainless steel at 1,650°C. is poured into the shell moulds.

machine is even more impressive and even the small insight into glass manufacturing processes which the visitor is given at this stand must make him wonder whether much that present-day techniques produce could be achieved without the use of gas. For what other fuel could provide the amazing range of flames required, from the relatively gentle heat of the annealing lehr to the needle-like high-temperature flame essential for some of the high precision processes?

SHELL MOULDING

A COMPARATIVELY new process in industry, shell moulding may now be said to have 'caught on', and though its application is not unlimited it is making rapid progress. Basically the process consists of making a light shell composed of silica sand and thermo setting resin to replace the bulk cope and drag section of the conventional sand mould.

Where applicable this system offers advantages of greater speed and increased production coupled with greater accuracy of shape and improved castings and reduced machining. It provides a new and growing outlet for gas, and virtually for gas alone, because almost every manufacturer of shell moulding uses gas.

These moulds can be seen in process of manufacture on stand F where this technique is demonstrated with a shell moulding machine and a sand mixer by Fairbairn Lawson Combe Barbour, Ltd. The accent in the development of this type of equipment has been more and more toward fully automatic machines.

HEATING LIQUIDS

SCARCELY an industry exists in which the heating of liquids, as for example, for the removal of dirt and grease, do not enter as essential production stages. Stand J is devoted to this application of gas in industry—an important application which already accounts for some 20% of the entire industrial load.

The advantages of gas for the heating of liquids are, of course, already widely accepted. Unfortunately, however, its potential contribution to the more efficient use of fuel does not seem to be so well appreciated. This point is strikingly illustrated on stand J by the North Thames Gas Board with the aid of two identical gas heated tanks, one in which the heating arrangements are efficiently designed, the other in which the design is inefficient.

This demonstration, which is fully illustrated, should give the visitor food for thought—and may well lead to a reduction in the number of inefficient appliances now operating up and down the country. As their efficiency figures range around the 30% mark—against 60% for the well designed appliance—their replacement or modification, apart from benefiting the user, would contribute to improving the general fuel situation.

An automatic tubular-heated degreasing plant used for motor vehicle engines and parts.

An interesting exhibit on this stand is a submerged combustion unit by Nordac Ltd. This is of special application in the heating of corrosive liquids as the flame is directed downwards and actually burns in the liquid, the products of combustion bubbling up around it.

Other liquid heating equipment on stand J is by Dowson & Mason, Ltd., Neil & Spencer, Ltd., and R. & W. Winter & Co. Ltd., while D. S. Fordyce & Co. Ltd., A. F. Rason (Engineers), Isaac Braithwaite & Sons (Engineers) Ltd., and Controlled Flame Boilers, Ltd., provide examples of steam-raising equipment.

HIGH TEMPERATURE RADIANT HEATING

IT is to be hoped—and, indeed it is likely—that stand G will go a long way toward making good the lack of publicity that high temperature radiant heating has received in the past. Radiant heating is nothing new—life on this planet depends on its emission by the sun. But its application in industry has not received the attention it deserves. It is not applicable to every industrial process requiring heat but where it can be employed it offers enormous advantages.

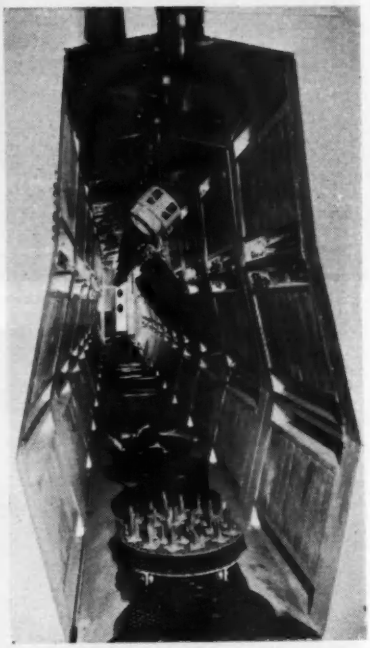
The radiating surfaces of this form of heat operate at temperatures of between 600° and 1,000°C., producing flux densities of up to 80,000 B.Th.U. per sq. ft. per hour. Many industrial processes to which it can be applied require very substantially lower temperature and the control of the final temperature of the work is effected solely by the time of heating allowed, rates of heat transfer far in excess of those obtained in convection ovens being achieved. Production times can by this means be drastically reduced.

Equipment operating on this stand comprises Rapiradia plant by Stewart Gill & Co. Ltd., collapsible tube annealing plant produced by the North Thames Gas Board for Impact Extrusions, Ltd., and a horizontal panel by Bratt Colbran, Ltd. The firing of lettering on wine glasses and the annealing of aluminium toothpaste tubes is demonstrated, and on this stand the exhibition goes a trifle light hearted and little sugar Mr. Therms are seen being baked onto biscuits for the visitor to sample.

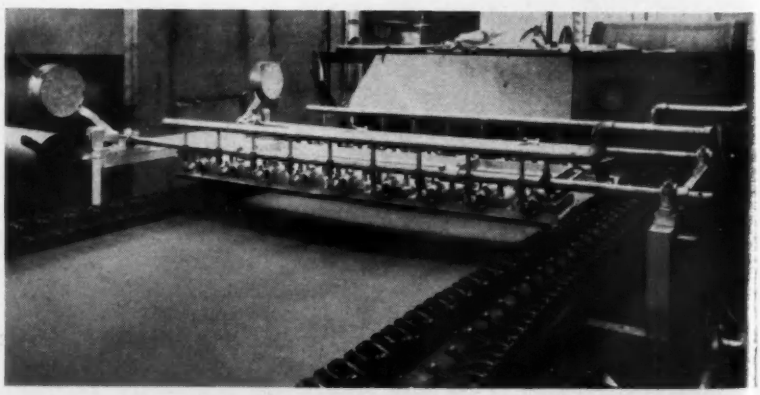
In this field, gas has the advantage all the way. No other fuel—not even, as might have been expected, electricity—can match it as a source of high temperature radiant heat. It may be produced with low pressure jets in conjunction with refractory or metal radiants or surface combustion units, air/gas mixtures with surface combustion units, and high pressure jets using metal disc or refractory cup radiants according to the particular application.

INFRA RED RADIATION

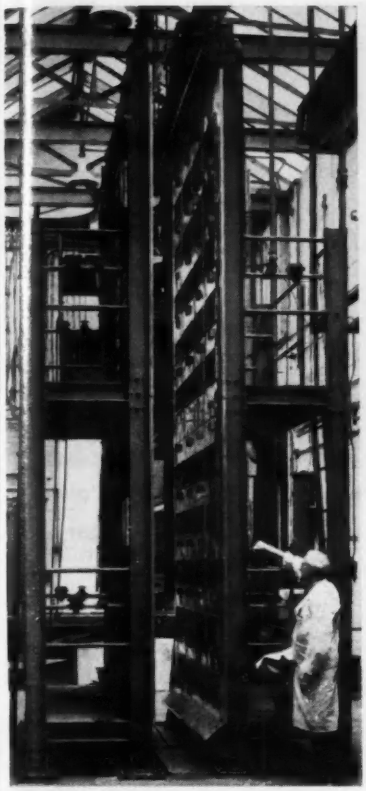
LESS spectacular but no less important is the low temperature dull or black radiant heat emitter which operates at around 330°C. Reductions of 10% in oven drying times are common where this form of heat is used to replace convection. These emitters take two forms. Of these one comprises semi-circular sections which are used to form



An infra-red tunnel comprising 66 panels and capable of dealing with 1,000 components an hour on two independent conveyors. Full automatic control is employed.



High temperature radiant heaters on a stentor machine for drying textiles after dyeing.



Twin walls of 40 infra-red panels are seen here in use for drying anti-rust coating on metal frames and long metal sections carried by overhead conveyor.

a tunnel, the inner surface being heated by gas burners located between the sections and the outer insulated wall; the other consists of panel units, heated in the same way, and attached to a supporting framework in any desired shape.

Examples of gas fired industrial radiant heating (infra red) equipment as well as of convection heating equipment are found on stand D. Here continuous plant is seen in operation consisting of an infra red tunnel by Parkinson & Cowan Industrial Products and a camel back oven by F. J. Ballard & Co. Ltd., fed from a spray booth by Aerograph Co. Ltd. The stoving of paint—one of many applications in industry—is demonstrated. There is also a box oven by the last-named firm incorporating a range of control devices.

METAL MELTING

AN important consideration in the application of gas to the melting of metals is its ease of control contributing to maintenance of correct levels of output. This is admirably illustrated on stand E where a die casting machine (Edgwick) by Alfred Herbert, Ltd., is seen making valve handles. Also on display are furnaces of various applications by A. G. M. Industries, Ltd., British Furnaces, Ltd., and Morgan Crucible Co. Ltd.

While gas as a fuel for metal melting in externally heated furnaces has the advantage of ease of control, it really comes into its own in the internal or immersion heated furnace. Here the heat of combustion may be entirely surrounded by the material to be heated so that losses due to heat absorption by brick combustion chambers is eliminated.

Saving in Insulation

In addition, the thermal capacity of an immersion heater is substantially lower than that of a normal bricklined furnace so that, here again, much closer and speedier control of temperature can be effected with substantial saving in fuel. A further advantage is more efficient insulation of the pot for a given thickness since the insulating material is not in contact with the hot gases.

A type HLP, Mark II, hydraulically-tilted Morgan crucible furnace.

HEAT TREATMENT OF METALS

ANOTHER enormous field for gas in industry is the heat treatment of metals. This application of gas is illustrated on stand N where a bright batch quench furnace by Birlec Ltd. dominates the scene and is, indeed, one of the features of the entire exhibition.

The chamber of this furnace is heated by vertical gas-fired radiant tubes—it was the development of radiant tubes that made it possible for gas to compete in this type of furnace. Maintenance of the required protective atmosphere is ensured by gas-tight doors the prepared gases being fed into the working chamber as required.

In operation a rich gas/air mixture is passed over a catalyst bed in an externally heated retort tube so that complete reaction of the gas and air is obtained,

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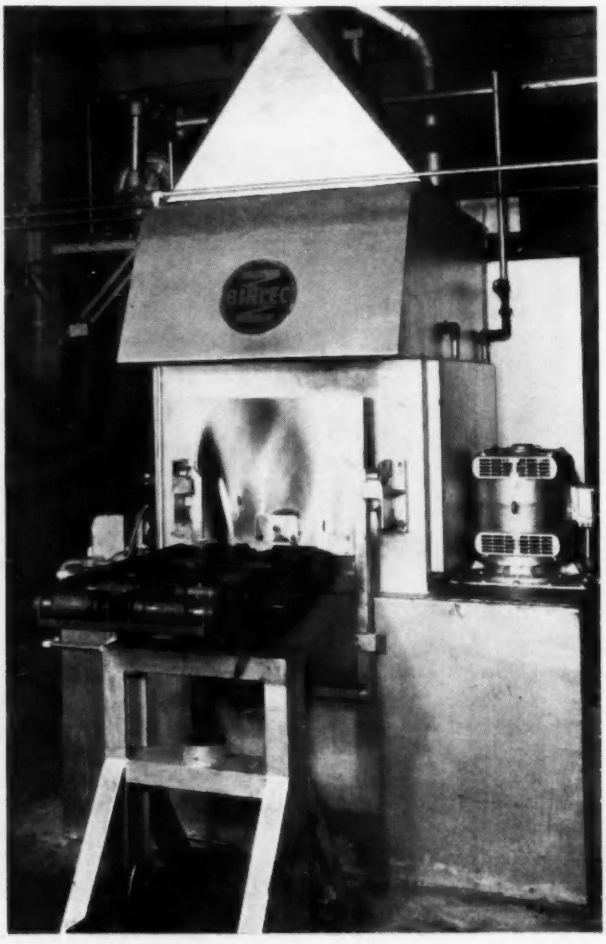


General view of a Birlec gas fired sealed quench furnace for heat treatment. These furnaces are used for case hardening processes; in particular for toughening gear wheels and other auto-transmission parts. In this instance, the furnace is employed in hardening vice jaws. This furnace is the largest single piece of gas fired equipment in the exhibition.

★

yielding a mixture consisting basically of nitrogen, hydrogen, and carbon monoxide, as well as some carbon dioxide and methane according to the gas/air reaction ratios. A compressor draws gas through a regulating valve, flowmeter, and control valve, and air through a filter, flowmeter and control valve, the mixture being fed through an oil filter to the bottom of a vertical retort heated by gas and automatically controlled. The applications of the furnace are the hardening of carbon steels, carbo-nitriding or carburising steel parts, and restoration to normal of partly decarburised steels. The result is clean work completely free from scale and distortion, needing no further processing.

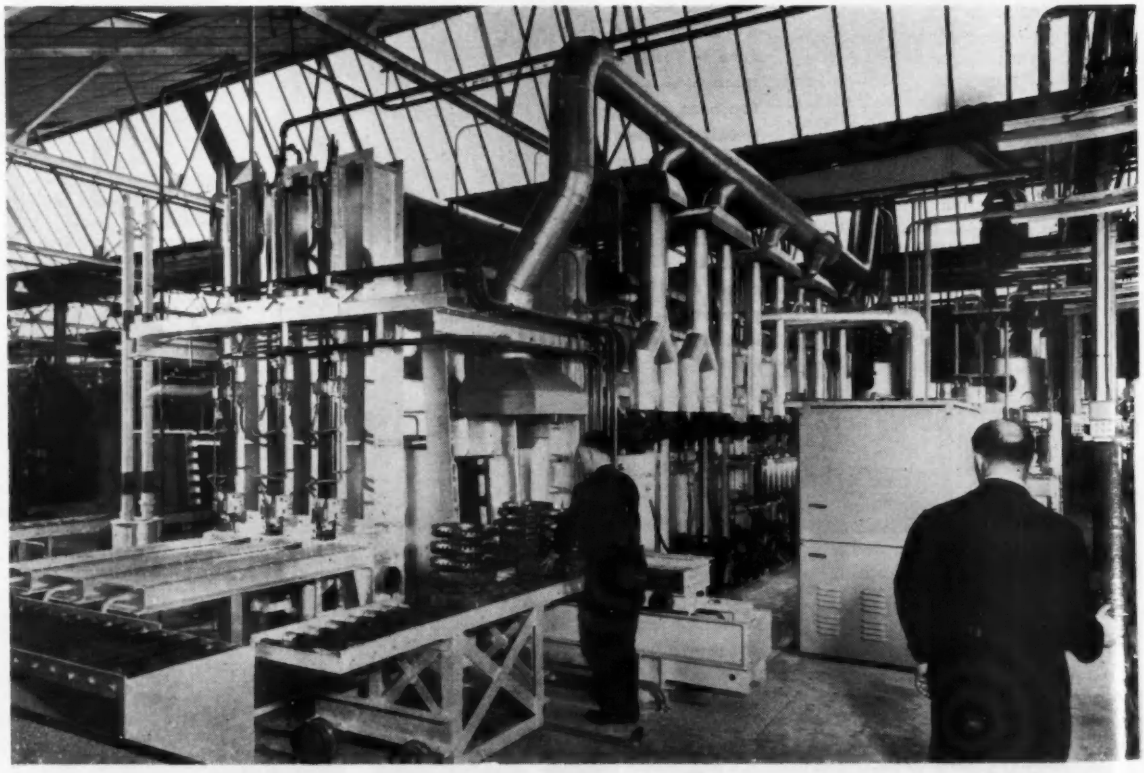
Other furnaces of various application seen on this stand include products of J. L. S. Engineering Co. Ltd., Thermic Equipment and Engineering Co. Ltd., Brayshaw Furnaces and Tools, Ltd., Manchester Furnaces, Ltd., and the Incandescent Heat Co. Ltd. Of the last-named firm's two exhibits, one is their Jetube burner firing a jet into a tube creating action resulting in uniform heating throughout the tube. Ease of control at elevated temperatures is a feature.

Recirculating convector conveyor plant for drying tinplates after printing.

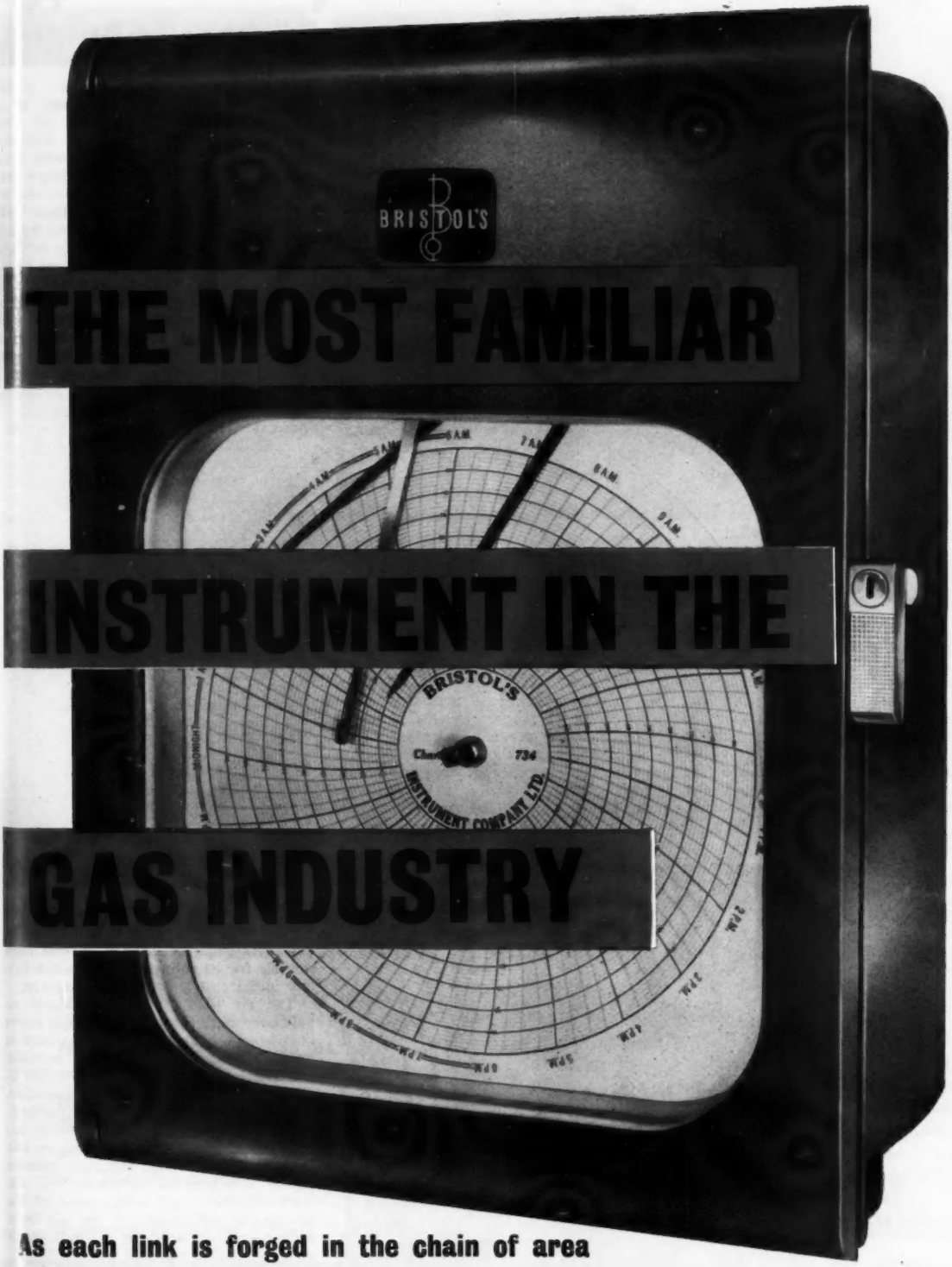
WELFARE FACILITIES

PROVISION of hot water, catering facilities, and space heating in industrial premises are the themes of stands A, B. and C. respectively. The importance of the satisfactory provision of these services cannot be over-emphasised. On them depend the contentment and well-being of the operative force on which depends, in turn, the whole efficiency of the factory. However, it is not intended to make more than passing reference to these applications of gas in industry here as the advantages which the fuel offers in these fields are already well known and, in any case, it is essentially the use of gas in industrial processes which is under review. The same to some extent applies to incineration equipment which is to be seen on stand P, though, of course, incineration is not so much a welfare facility from the point of view of the factory as from that of the community at large since it destroys potential sources of disease.

Equipment on these four stands is by Fredk. Kay Engineering, Ltd., Radiation Group Sales, Ltd., Thomas De La Rue & Co., Ltd., Potterton Gas Division, W. M. Still & Sons, Ltd., R. & A. Main, Ltd., Gardiner & Gulland, Ltd., Benham & Sons, Ltd., Radiant Heating, Ltd., Bratt Colbran, Ltd., F. A. Borchardt, Ltd., Autocontrol Boilers, Ltd., Ideal Boilers & Radiators, Ltd., William Sugg & Co., Ltd., & Harris Engineering Co., Ltd., Shanks & Co., Ltd., and Ascot Gas Water Heaters, Ltd.



A radiant tube-fired furnace for gas carburising gears and crown wheels. Throughput is 600 lb. an hour.



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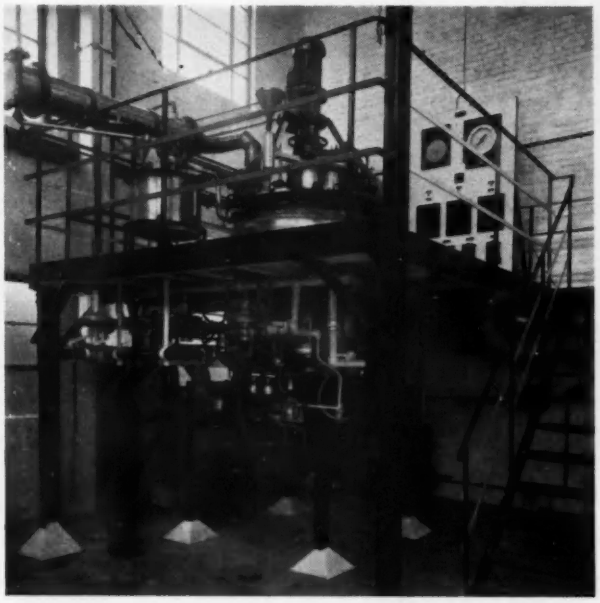


A 500-gal. alkyd resin plant heated by immersion tubes and with bottom-firing for moving solid resins.

INSTRUMENTS AND CONTROLS

WITH so much equipment actually working throughout the exhibition a not inconsiderable number of instrument and control devices are inevitably seen in operation also. Examples of this type of gear not incorporated in working exhibits are displayed on stand O.

Instruments in use today range from the familiar glass/mercury thermometers to the modern marvel of electronic ingenuity which not only indicates what is going on in the process concerned but will also record it and, when required, step in and take control.

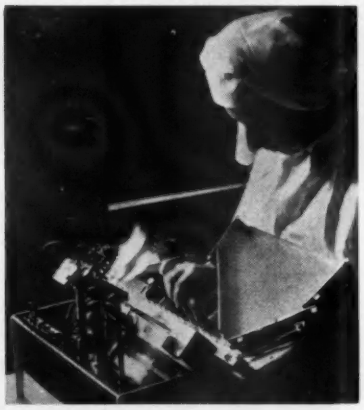
In making full use of these devices the gas industry keeps to the fore in present-day progress toward full automation and shows its appreciation of the fact that they are essential for the high efficiency necessary in processes involved in top-quality production.

Specially designed furnace for tube heating before bending. Movable sections allow any length of tube to be dealt with.

INDUSTRIAL BURNERS

ANY industrialist who might question whether gas was in a position to supply flames of the particular shape, size, and intensity which his process demanded would have his doubts dispelled after an inspection of stand K, where a quite remarkable display of burners is to be seen, as well as an interesting display of small industrial appliances such as brazing torches and soldering irons. The gas burner is, of course, the heart of the gas appliance. Though simple, it is remarkable in that temperatures up to 2,000°C. can be reached with consistency, reliability, and long service. Each of the four main classes offers its special advantages.

The low pressure burner of luminous type, of value in all low-temperature processes, is characterised by extreme simplicity, adaptability, cheapness and flexibility in heat control from virtually zero to maximum, and is thus eminently adaptable to thermostatic control. The aerated or bunsen burner, suitable for processes requiring up to 1,250°C., is notable for its robustness and durability, low initial cost and easy maintenance.



Gas flames are used for the hygienic sealing of ampoules containing vaccines

The air blast burner, applicable to processes requiring higher temperatures or where a high rate of heat release is needed to speed up output, provides working temperatures of up to 1,500°C. readily, without recourse to recuperation, and is easily and accurately controlled.

The high pressure burner, which has been found most useful in furnaces and long conveyor ovens requiring burners which will function correctly in the work chamber itself, offers most of the operational advantages of the air blast burner and yet requires a small single pipe to provide the fuel gas.

The high pressure gas/air mixture burner, of application where the flames are to burn within a confined space, can be supplied with ready mixed fuel at a very high pressure behind the burner nozzle. Plant used to supply the mixture has been adapted to generators of protection atmosphere gases used in the bright, clean heat treatment of metals.

(*Concluded on p. 193*)

"Conveying and Elevating at 35°!"

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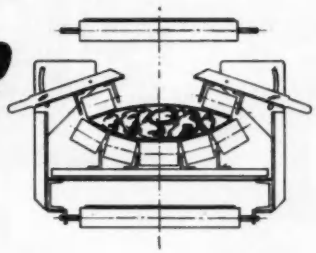
BLANKET CONVEYOR

This 30" Blanket Conveyor installed in October, 1955, at the BOW COMMON WORKS of the NORTH THAMES GAS BOARD, conveys 50 tons per hour of retort coke at an angle of 35 degrees. In its first 12 months of operation, over 150,000 TONS OF COKE have been handled without any trouble whatsoever and no call for spare parts. It is equally suitable for handling coal.

Photograph by courtesy of North Thames Gas Board.



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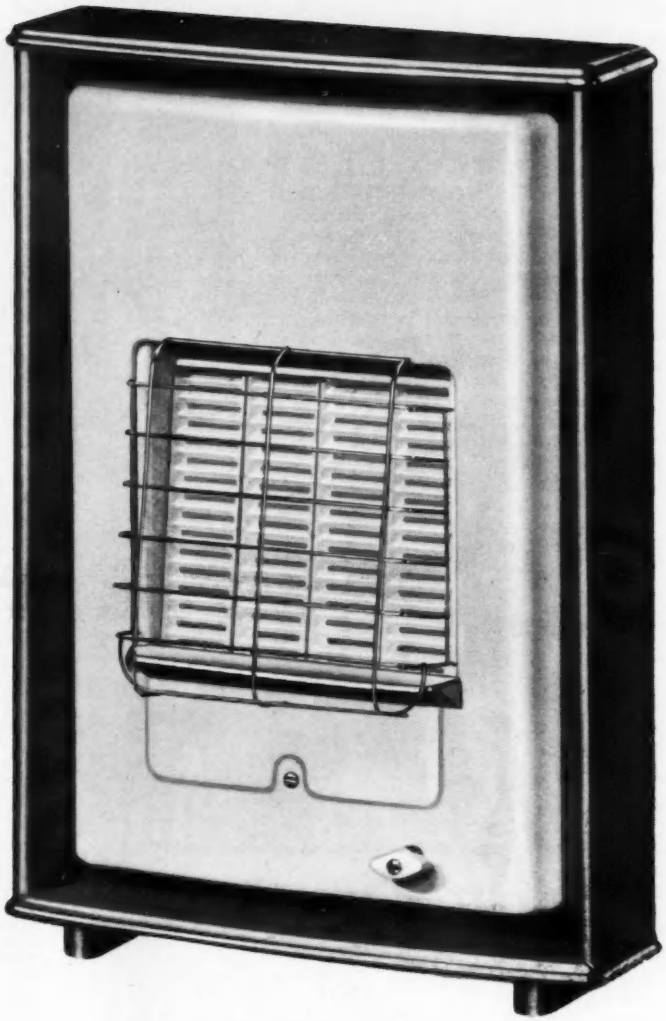

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CENTRAL FEATURE

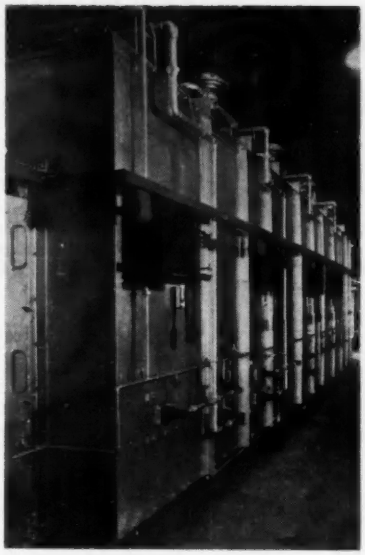
FACING the visitor as he enters the exhibition is the central feature which consists of a truly impressive array of the products of a large variety of industries in the country in the manufacture of which the gas industry played some essential part.

It bears striking witness to the part which gas already plays in almost every branch of the industrial life of Britain.

To attempt to name even a proportion of the things seen on this stand would be impracticable, but reference must be made to the cut-away Eland jet aero engine with its turbine blades slowly revolving, over 1,000 components of which were treated in gas-fired equipment during manufacture.

Elsewhere in this issue we have complained that too little has been done in the past by the gas industry at large to attract the industrial consumer. Stand I is an amazing tribute to the way in which the fuel itself has won its customers on its merits alone. Further evidence of this—not seen physically in the exhibition—is found on stand Q where models and photographs are shown of bulkier gas-fired equipment.

A DEVELOPMENT SCHEME



The heating section of an 86-ft.-long fully automatic conveyor plant for treating television tubes.

AS we have also said elsewhere in this issue, much credit must go to the handful of hard-pressed industrial officers in the gas industry for their success in making good the general apathy in publicising this field. Stand H draws attention to the fact that the development workshops of the gas boards are always willing to carry out experiments and design prototype plant for special or untried purposes. This is a fact of which a great many industrialists are probably unaware, and the inclusion of this stand, on which is to be seen a combined forge furnace and blow pipe brazing hearth by A. H. Wilkes & Co., was a most wise decision.

And if the non-gas-using industrialist who visits the exhibition should leave it with any doubts in his mind on how a change to gas could benefit him, it is to be hoped that he will remember that the accumulated knowledge and experience of the entire gas industry is always at his disposal in the form of the gas industry advisory service.

Everything possible should be done as a matter of priority to give this service the widest publicity among industrialists throughout the country.

Where to Draw the Line

IS there a dividing line between domestic and industrial-commercial work? Naturally there is, but how much of the small non-domestic jobs should become the prerogative of the industrial department. I feel that it is safer in this area to look after all non-domestic applications with the general give and take elasticity that the system provides. It is always said that in any organisation, the clear definition of duties and responsibilities is of the greatest importance, and that the division of sales and service into domestic and non-domestic provides the simplest partition for administration. I feel that this must depend entirely upon the type of district served. In the highly industrialised centres, the industrial men should have enough to think about without the smaller commercial work, and better service to both can be given. Here in the South West, we are called upon to handle all non-domestic applications and some domestic, such as central heating and large scale hot water— in fact any installations requiring specialised service. The larger the consumer in any field, the greater his demand for specialised service.

From 'Increasing Demands Demand Service,' a paper presented to the Western Junior Gas Association by J. B. Bowler, Industrial Engineer, South Western Gas Board, Bristol-Bath Division, Bath District.

Manual of Belt Conveying

WITH the important rôle that the bulk handling of materials plays in the gas industry today, Mr. Harold Street's new publication, 'Sutcliffe's Manual of Belt Conveying,' will be a most welcome addition to the considerable volume of literature already available on the subject; previous writers have tended to confine themselves to general expressions of principle. Mr. Street goes further and takes his readers into the realms of the precise application of modern conveying practice.

The book contains much of the accumulated knowledge and practical experience gained during the past half century by the Wakefield firm of Richard Sutcliffe, Ltd., which has played a leading part in the development of belt-conveying practice. For the engineer, the book contains numerous graphs, tables, and diagrams as well as a large number of photographic illustrations. Published by T. and A. Constable, Ltd., at 25s., this book is highly recommended.

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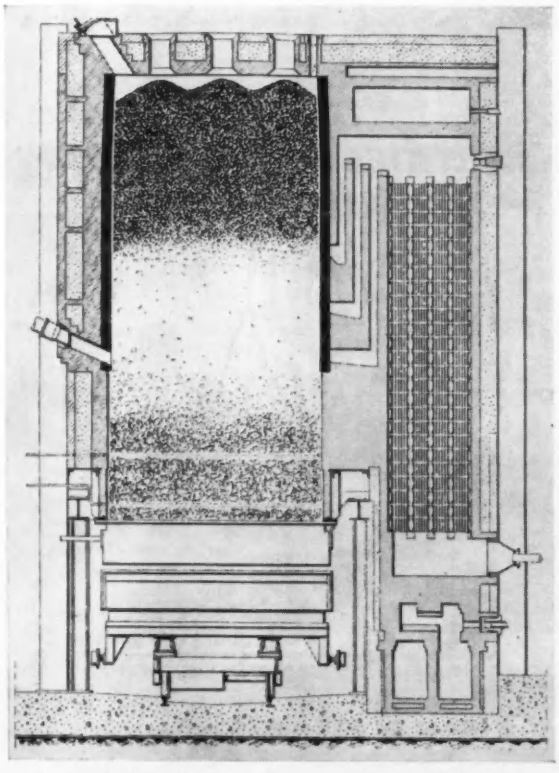
Abstracts from Some Foreign Publications

Static Vertical Ovens in Dutch Works

The main alteration in the new cooling chambers was to change them from a double to a treble stage system. The original chambers were only heated in the upper section, the carbonising space, while the lower part, the cooling chamber, had no heating flues. The coke was cooled in the cooling chamber and in the cooling box, made of iron at the bottom of the oven. For this purpose steam is introduced with the formation of water gas. When the coke is then withdrawn, only five centimetres below the carbonising space remain red hot, while the drawn coke is almost cold and requires only a little further cooling. During the withdrawal, the newly formed coke in the carbonising chamber above slides down and fills the cooling chamber again. Unlike that in the continuous vertical retort, the coal is carbonised in a static state, and so can form big lump coke and shrink to such an extent that the charge cannot hang. The advantage over the continuous vertical retort is that better use is made of heat and the freedom from having to select special kinds of coal. It was then decided to change the two-stage system into a three-stage one. For this purpose, the cooling chamber space is reduced in size, compared to the carbonising space. When drawing the coke, only the lower half of the coke, formed in the carbonising chamber, slides into the cooling chamber and only the upper half of the carbonising chamber is refilled. The coal is first pretreated in the upper half of the carbonising chamber and at a second stage in the lower half where it is completely carbonised, and then at a third stage cooled in the cooling chamber with production of water gas. By this procedure, the average production is increased without taking up any more ground surface space, and efficiency of water gas production is raised. The water jacket of the lower part of the cooling chamber is cooled to about 95°C. by a thermosiphon. This prevents the wet steam blown into the upper part of the cooling chamber for the production of water gas being cooled too much in the lower part or even condensing. An attempt was made to improve on the usual refractory recuperators by equipping the lower part with cast steel recuperators fitted with fins. On these the normal refractory brick recuperators were mounted. The first tubes had a 1% aluminium content but as they rusted, these were changed to cast chrome steel tubes; the chrome content amounted to 26-27%. But they required continuous supervision and care to prevent over-heating, especially when work was stopped. Finally the Otto elliptical refractory recuperators were installed and gave complete satisfaction as the refractory material is made in a solid piece and prevents all leakage, a danger present with the former types.



Otto vertical cooling chamber oven with Otto elliptical refractory recuperators.

E. H. Berkhuijsen. *Das Gas- und Wasserfach. Vol. 97. No. 21. November 1, 1956.*

Using Lignite in Yugoslavia

Yugoslavia being poor in coal, reliance has to be placed to a great extent on the use of lignite. For the purpose, the lignite deposits at Kolubara are worked in open-cast; they are estimated to contain 2,000 mill. tons. The analysis of the raw lignite, however, shows the presence of about 50% of water, 10-20% of ashes and a calorific value of 1,400-2,000 kcal. per kg. The main object, therefore, is to dry the lignite and free it of impurities. Unfortunately it has been found that drying causes the lignite to disintegrate if the usual direct or indirect processes are used. For this reason, experiments with the Fleisner method in autoclaves under pressure have been made, and it was found that from 50% the water contents were reduced to 16-18%.

Previous to the drying process the lignite has been washed and separated into pure lignite, lignite mixed with impurities, and impurities. To obtain these results the raw lignite is first cut into pieces of less than 100 mm. (4 in.) and then passed through a 20 mm. (.8 in.) sieve. The pieces below 20 mm. go to an electric power station while the larger pieces are washed and separated into the three types mentioned above. Of these the first lot is sent to the drying plant, the second to the electric power station and the third to the refuse dump. In the drying process the following changes are made: Moisture from 50% to 18%, ashes from 19.46% to 13%, total sulphur from 0.57% to 0.49%, fixed carbon from 11.29% to 32.30%, calorific value from 1,706 to 4,415 kcal. per kg.

The impurities consist mainly of clay and are washed out as mud. In its dry state the lignite is easy to transport and serves domestic heating, power stations and even locomotives, where the friable ashes without any slag formation are of great advantage.

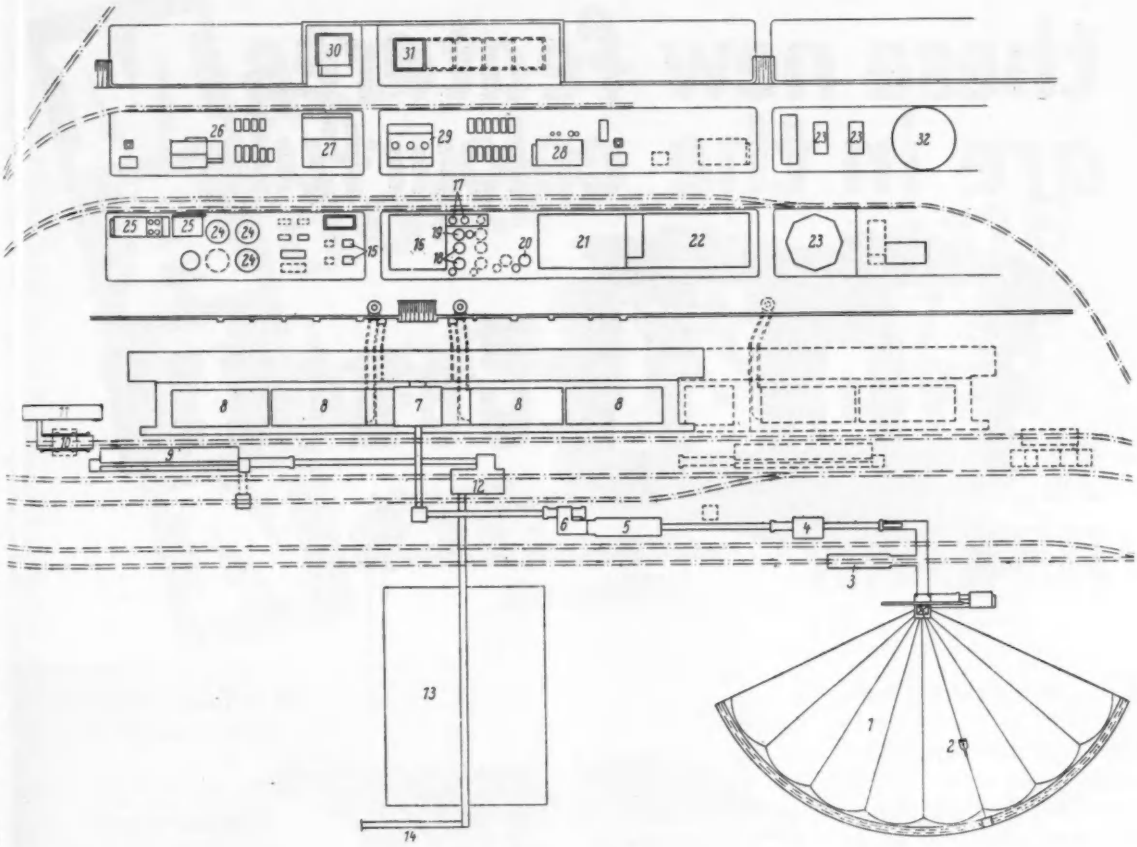
A further interesting application of lignite is its use in the production of coke. No coal suitable for the purpose is available in the country, the only deposits being of bituminous coal. Long experiments have led to a mixture of this coal with brown coal and lignite or semi-coke recovered from lignite.

The percentage of the additions depends on the bituminous contents of the coal. For the production of coke a 1,350,000 ton per annum plant has been constructed. The resulting coke is used for all metallurgical work as it does in no way differ from coke derived from fossilised coal. It was found possible to stop the importation of the latter.

B. Popovic. *Gas.* Vol. 6. No. 7-8. July-August, 1956.

New Coke Ovens In Mexico

To avoid a long transport of coke and to limit its importation from abroad, the Government Concern which owns the Altos Hornos de México, in Monclava, one of the two existing blast furnace plants, decided to erect coke ovens on an adjoining site. The plant included the production of sulphate of ammonia, benzole products and tar, etc. While basically, the usual methods are employed, it is interesting to see how the layout of the coke ovens leads to an exhaustive utilisation of, one may say, every particle, of the coal from which the coke is derived. The coal arriving from the mines is unloaded into a deep pit with a slotted bottom from which it is transported to the stock pile or by transporter band to the grinding plant



1. Coal store.
2. Scraper plant.
3. Coal pit.
4. Coal crushing plant.
5. Coal blending bunker.
6. Coal blending plant.
7. Coke oven bunker.
8. 114 circulating flow coke ovens.
9. Coke discharge wharf.
10. Coke quenching tower.
11. Purifying plant for coke cooling water.
12. Coke grading plant.
13. Coke store.
14. Coke band conveyor to blast furnaces.
15. Primary gas cooler.
16. Turbo exhauster plant.
17. Electro detarrers.
18. Benzole washers.
19. Liquid purifier plant.
20. Final gas cooler.
21. Sulphate of ammonia plant.
22. Sulphate of ammonia store.
23. Cooling towers.
24. Storage tanks for tar and ammonia liquor.
25. Sulphuric acid plant.
26. Tar distillation plant.
27. Stirring coolers for anthracene and naphthalene.
28. Crude benzole plant.
29. Benzole distillation plant.
30. Acid regenerating plant.
31. Storage tanks.
32. Gas holder.

On the way it has to pass an apparatus which detects the presence of tramp iron and gives the alarm if any should be present. From the hammer mill, the coal is passed to the blending bunker, which is divided into four compartments. Below these compartments are revolving plates which control the composition of the blend. Double helical screws mix the coal more intimately and from these the blended coal passes by travelling band to the coke oven charging bunker. This bunker's hopper sides are fitted with glass sheets; down which the coal drops into the charging cars and passes to the oven chambers. The carbonising plant consists of two batteries of 28 ovens each. The red hot coke is pushed into the coke car and quenched under a quenching tower. It then passes to a wharf 50 m. long to be freed from steam and is then raked on to a band conveyor which takes it to the screening plant. The blast-furnace coke is screened over a grisly screen; that above 40 mm. can be taken directly to the blast furnaces. The small coke is graded into the sizes: 40—20, 20—10 and 10—0 mm. Coke from outside may also be brought in for screening at this plant, which is fitted with the necessary handling gear. By-products derived from the carbonisation are: Tar, benzole, sulphur, from sulphuretted hydrogen by the addition of sulphur, and sulphate of ammonia, the latter being a new product for Mexico, which so far has had to import fertilisers from abroad. The tar is used for roadways, roofing felt, and the lining of pipes, while its creosote oil is used for the impregnating of timber, etc. Coke oven gas is at present being used for underfiring and the surplus gas for the blast furnaces. At some future date, as the demand for rich gas by the furnaces increases, it is proposed to use blast-furnace gas for underfiring the coking plant. A duplication of the entire plant is under consideration; this will include a phthalic-acid plant. The importance of the existing blast-furnace plant at Altos Hornos may be judged by the fact that it supplies 37% of the steel requirements of Mexico. The by-products have given an impetus to the chemical and dye industry, and there is every hope of making the country independent of imports and reducing the adverse trade balance.

W. Fitz. *Das Gas-und Wasserfach, Vol. 17, No. 21. November 1, 1956.*

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* **The ADONIS is available in CREAM, WHITE BLUE or GREEN vitreous enamel finish**

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Propane-butane Air Gas Plant at Copenhagen

In the autumn of 1955, two identical plants for the addition of propane-butane gas to town gas were installed at the Ostre gasworks and the Valby gasworks in Copenhagen. For the sake of brevity the liquefied propane-butane gas is referred to as propane liquid and the vaporised propane-butane gas as propane vapour.

As the calorific value of the Copenhagen town gas is about 4,200 kcal per N cu. m. and that of the propane vapour about 25,000 kcal per N cu. m., about five times as much air must be added at the same time as the propane vapour. The flow of propane vapour and air is regulated on the basis of the calorific value as follows:—

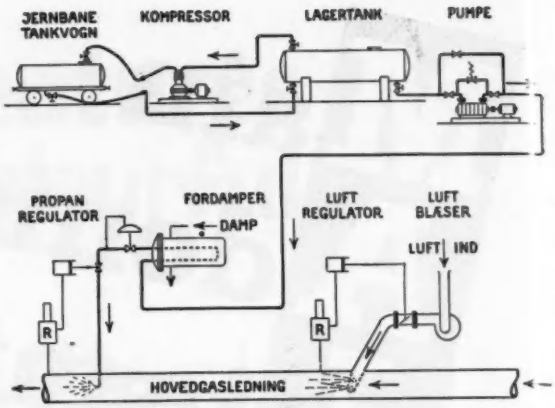
Air is added to the gas conveyed from the gasholders by means of a centrifugal blower. The flow of air is regulated by an automatic valve controlled by a Reineke apparatus, a sample of gas being taken at a suitable distance from the point where air has been added. Propane vapour is added further along the gas main, also by means of a regulating valve, and a little further along another sample is taken for a second Reineke apparatus which controls a regulating valve for the flow of propane vapour.

The plant is provided with an electrical safety device for instant shut-off of the supply of air and propane vapour in the event of faulty operation.

The plant consists of the following components: Two storage tanks, each of 120 cu. m. capacity and tested to 20 atms. pressure are provided.

The propane liquid is delivered in tank trucks and forced into the storage tanks by pressure being applied over the liquid by a compressor drawing propane vapour from the storage tank.

The propane vapour is passed by a multi-stage centrifugal pump to the coil-type evaporator, via a metering orifice, reduction valve and regulator. The propane is fed into the main through a multi-ported manifold to ensure thorough mixing. The air is mixed in the same manner.



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Pumpe	... Pump.
Propan regulator ...	... Propane regulator.
Fordamper ...	... Evaporator.
Luft regulator ...	... Air regulator.
Luft blæser ...	... Air blower.
Luft ind	... Air in.
Hovedgasledning ...	... Gas main.
Damp	... Steam.

The plants were put into operation just before Christmas, 1955, and have proved satisfactory in all essentials.

C. Ilving and H. Tvermosegaard, *Gasteknikeren, Vol. 45, No. 15, pp. 237-242, August 7, 1955.*

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Introduction to the paper presented to the 22nd Autumn Research Meeting of the Institution of Gas Engineers.

Forced Recirculation In Industrial Gas Appliances

By W. E. FRANCIS, B.A.
MIDLANDS RESEARCH STATION, THE GAS COUNCIL.

IN presenting this paper I must first of all point out that the subject matter has been arranged in an order which it is hoped will facilitate the use of the results by appliance designers. Consequently the main sections of the paper do not necessarily follow in strictly logical sequence. The work actually began with the development of the theory of jet-driven recirculation and its experimental verification. It then became obvious that a study of the effect of recirculation on heat transfer was necessary to determine the optimum rate of recirculation. Finally, the importance of direct-fired drying processes made it desirable to investigate the effect of recirculation on humidity and efficiency in driers.

The term forced recirculation is intended to apply to the deliberate recycling of flue gases through an appliance so that, on average, gases pass through the heat transfer section many times before leaving the appliance through the flue.

The use of forced recirculation in industrial gas appliances is becoming of increasing importance as a means of attaining temperature uniformity, temperature limitation and high convective heat transfer rates. Recirculation of combustion products is normally provided by means of a hot gas fan or by using a high velocity jet burner to force gases through the appliance. In either case the optimum rate of recirculation and gas temperatures for a given appliance duty may be derived from heat transfer considerations.

The choice of a fan to provide recirculation does not lead to any novel problems other than those arising from the need for the fan to handle gases at the working temperature of the appliance. However, in the case of jet-driven recirculation it is necessary to calculate the jet burner and appliance dimensions and gas and air supply pressures which will give the required rate of recirculation. The work described in this present report began with an attempt to derive a theory of jet-driven recirculation which could be applied to the design of industrial appliances.

In an appliance using jet-driven recirculation a high velocity stream of hot combustion products from a jet burner is allowed to entrain cooler combustion products from the flue end of the appliance. The residual pressure energy of the jet drives the mixed gases through the heat transfer section of the appliance. It was realised that the mechanics of the entrainment process and that occurring in the mixing tube of a burner injector were essentially the same. The calculation of entrainment in burner injectors has been put on a reasonably sound basis by the work of Silver, Waight, von Elbe and Simmonds and is supported by considerable experimental evidence.

Theory of Jet-driven Recirculation

The theory of jet-driven recirculation is presented in section V of the paper, and resolves itself into equating the pressure losses due to the flow of gases through the appliance, to the pressure rise due to the expansion of the jet stream in the mixing section. First the pressure rise in the mixing section is calculated by applying the momentum equation. Then, of the various components of the total pressure loss through the appliance those due to friction, bend and fitting losses, and losses due to changes of cross section, may all be assessed from data given in standard works of reference. The remaining pressure changes, due to heat transfer, buoyancy effects and the change of velocity at the flue exit, are dealt with in the paper.

The experimental verification of the theory has been carried out in two parts. First, it has been shown that the pressure rise in the mixing section is adequately predicted by the momentum equation. Secondly, it was necessary to show that recommended data for pressure losses was applicable with sufficient accuracy to appliances using recirculation. This was confirmed by measuring the recirculation in pipe circuits under both cold and hot conditions, and finally in a large duct circuit which included a heat exchanger of relatively high resistance to flow. It appears from both the theoretical and experimental work that the chief source of inaccuracy in the calculation is likely to be the assessment of circuit pressure losses in practical appliances. There seems to be a good case for simplicity in the shaping of flow paths in appliances, both from the point of view of minimising unnecessary turbulence and also for ease and accuracy of design calculations.

The relationship between jet and mixing duct diameters and temperatures, and circuit pressure losses has been generalised and presented in a graphical form which it is hoped will be suitable for design purposes. Since as a result of this work it is possible to design both jet and fan-driven recirculation systems to achieve specified recirculation rates it seemed reasonable to continue the work by investigating the factors affecting the choice of a recirculation rate. There are some appliances in which the purpose of recirculation is to achieve a high degree of temperature uniformity or a minimum temperature head. Obviously the maximum economic recirculation ratio will be used in these cases, but in general the relation between recirculation ratio, gas temperatures and heat transfer coefficients must be considered before a logical design can be evolved.

To have attempted an exhaustive account of the use of recirculation in industrial gas practice would have entailed far too long a paper and it is realised that there are many aspects worthy of study which have not been mentioned. It is hoped that some of these points will be dealt with by contributors to the discussion. However, it was felt that direct-fired aqueous driers were a class of appliances in which recirculation could be of considerable benefit and which were of sufficient importance to warrant the inclusion in the paper of a quantitative treatment. In a convective drier the rates of heat transfer and evaporation depend on the humidity level in the drier. It is obvious that the humidity is governed by the rate of fresh air intake and in a direct gas-fired drier it is possible to relate the constant wet bulb lines on the conventional humidity chart to the ratio of the total fresh air to gas rates. Using no recirculation the air to gas ratio is governed by the required drying temperature, so that if the drying temperature is severely limited by the nature of the material, the air rate and flue loss may be high. If recirculation is used the air rate is no longer dependent on the working temperature, and the flue loss may be made very low. The results obtained with an experimental drier using recirculation are in reasonable quantitative agreement with the theoretical deductions.

The technique of recirculation appears to have considerable possibilities of application in industrial gas equipment, and it is hoped that this work may stimulate the wider use of recirculation and also will provide the data needed for design purposes.

DISCUSSION

Mr. W. A. Lloyd-Dodd, Southern Gas Board, said that forced re-circulation was a most useful tool in the hands of plant designers. It was one of the most effective means of providing uniformity of temperature throughout the working space. It was only by recirculation that one could ensure optimum

saturation of the air or gases in drying and similar operations. The greater mass flow of gases resulted in an increased convective heat transfer coefficient, and this might be the only means for obtaining an adequate production rate in processes where the nature of substances imposes narrow limits upon permissible temperature differences. Such limitations might be imposed either by the risk of spoiling the product or by that of damage to structural materials as in the case of radiant tube applications.

This paper seemed to have bridged the unfortunate gap which so often occurred between the published results of research and their incorporation in every day projects. One question the plant designer must still answer for himself was the choice between fan and jet for the provision of recirculation. The choice was simple at either end of the temperature scale—in the lower end the fan was an obvious choice, while at elevated temperatures the jet was the only one—but in the intermediate range a decision was dependent upon many factors. It would appear to be largely a question of economics, and any available information or guidance, based on practical experience would be extremely helpful.

Burner system design was obviously more complicated in the case of jet recirculation, because the necessary momentum must be provided in addition to standard burner requirements relating to heat release, stability and complete combustion. Once a recirculation ratio had been decided, the information given in Figs. 1 and 2 of the paper enabled the burner jet diameter to be calculated, but it obviously remained to be seen whether or not this size of jet would be practicable for the required heat release—practicable that was in terms of supply pressures, stability and noise.

Section 4.—'The use of recirculation in direct fired driers,' in which the application of the theory to appliance design was discussed, also emphasised the lack of data relating to the drying process. The author mentioned the panel recently set up by the Industrial Gas Development Committee to study the problem, and they were pleased that the author had found it possible to serve as a member of the panel. The collection of such data would, however, be a slow process and they must not expect immediate results.

A Word of Warning

He went on: 'I must add a word of warning at this stage. There are a number of processes similar to drying but in which inflammable vapours are evolved in place of water vapour, and care must be taken in applying the principles outlined in this paper to such curing and stoving processes. Recirculation obviously tends to increase the vapour concentration, and while this is simply a question of determining optimum conditions in the case of water vapour, there are important safety limits to be considered where inflammable vapours are concerned.'

Mr. L. Walker, West Midlands Gas Board, said that with both systems of recirculation described, a fan was necessary to provide the energy required to propel the gases around the circuit and it was of interest to consider the relative cost of the fans required for the two systems. If they assumed that an installation required a gas rate of, say, 1,000 cu.ft. per hour (450 B.Th.U. per cu.ft.) and that a recirculation ratio of 5 to 1 could be achieved with either system when operating at a temperature of approximately 400°C., then for the jet system they would require a fan delivering 70 cu.ft. of air per minute at 28 in. w.g. The cost of this unit, complete with electrical equipment, would be of the order of £48 and the absorbed horsepower approximately 1.5. For the fan assisted system they should require a hot gas fan capable of handling 1,000 cu.ft. of products per minute at a temperature of 400 to 450°C. and against an assumed resistance equal to 1 to 1½ in. w.g. The cost of this unit, again with electric motor, etc., would be in the region of £150 and it would absorb approximately 1 horsepower.

The cost and type of fan required to handle hot gases would vary, of course, with the temperature required. Generally speaking the normal standard fan, with the addition of a cooling disc at the point where the shaft entered the casing, could be used for temperatures up to 250°F. For temperatures in excess of this figure and up to approximately 450°C. the fan would be belt driven and fitted with special high temperature packings. The bearings would still be air cooled and no special materials need be used for the impeller and casing. Above 450°C. the unit would require a more robust construction having water cooled pedestal bearings, and heat resisting alloys would be used for the impeller and casing. The actual alloy used would of course depend on the temperature requirements. The water consumption for the bearings would be of the order of 1 gal. per minute at normal mains pressure. The cost of a hot gas fan for the duty previously mentioned but at a temperature of 500 to 600°C. would be approximately £300. If the temperature was raised to say 750°C. the cost would be nearer £500, while at 1,000°C. they might have to pay as much as £1,000.

The upper limit to temperature for a fan unit was probably in the region of 1,150°C. It should be appreciated, however, that when working at temperatures of this order the impeller must be regarded as an expendable item, probably costing £200 for replacement.

With regard to the fans required for jet recirculation, they could usually obtain pressures up to 40 in. to 42 in. w.g. with a single stage fan and up to approximately 60 in. w.g. with a two-stage unit. Above this they would have to use a positive pressure blower. As a general guide it could be assumed that a 50% increase in pressure would double the cost of the fan. The burner employed for jet driven recirculation would usually be of the air blast type, but they must remember that only 25% of the pressure energy of the air stream was available for use in the recirculation process.

Mr. Walker said: 'I assume that the constant given as 0.65, in the equation used for the heat content of gases emerging from a jet nozzle, is an average one for a range of gases having varying C.V. and composition. It would obviously be advantageous for anyone designing jet driven recirculation systems to calculate and use the value applicable to the gas to be used.

Need to Exercise Caution

'In the introduction the author tells us that, depending on circumstances, the effects of recirculation can be of considerable importance in the design of an efficient appliance, and I feel that the paper may tend to give the impression that recirculation can be widely applied and that the only decision to be made is the choice between using a fan or a jet for the driving force. I would suggest we exercise caution when considering applying recirculation to existing plant as a loss in overall efficiency rather than a gain may result due to leakages, incorrectly proportioned passages and the position of flues, etc. In the case of new plant it may be desirable to use recirculation to gain one or more of the advantages described by the authors; but we must bear in mind that if there is no limit to the maximum temperature at which the products of combustion can enter the appliance, then there may be no improvement in thermal efficiency by the introduction of recirculation.'

Dr. W. A. Simmonds, Midlands Research Station, said: 'The establishment of the Midlands Research Station provided a ready made opportunity to review and realign the research on utilisation of gas. This led to the work reported in this paper . . .

'Obviously, the appliances are very varied and their standard is not uniform; some are better than others. Equally obviously, there are many problems on which research could be usefully carried out, some of which are being tackled at Fulham and Solihull. Some of these are concerned with present problems; for example, the improvement of immersion tube heating, the reduction of noise and the study of combustion chamber design. Others are attempts to solve problems which may reasonably be expected to arise in the future, such as the development of high temperature furnaces, the development of burners giving large, fast streams of combustion products at moderate temperatures, and the study of combustion at high pressures . . .

'The present paper is the first result of this work. The subject of deliberate recirculation was chosen because the principle of operation, although not novel, is now beginning to be used more commonly and it has not been given adequate theoretical treatment to enable it to be applied to design calculations. It is also a subject amenable to heat transfer calculations since it depends on forced convection, and is theoretically an extension of the work on burner entrainment already carried out at the Midlands Research Station. We are very interested in obtaining reactions to the validity of the reasoning leading to this kind of design work and particularly to the method of presenting the results.'

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Mr. R. J. Broomer, F. J. Ballard & Co., said there was, he felt, one very important factor which should be borne in mind when designing forced recirculation systems in paint driers where the volatiles were of an inflammable nature, and that was the hazard of explosion.

He went on: 'Perhaps the most common form of paint drying stove incorporating recirculation is the camel back, aptly named for obvious reasons. If such an appliance were incorrectly designed, it would be possible that after recirculating the products of combustion through the drying zone and heater which is usually mounted as a separate unit immediately beneath the stoving chamber, the volatile concentration could build up sufficiently to exceed a safe level. This state of affairs can be relieved either by introducing diluent air into the system in sufficient quantities to keep the concentration below this limit, or by the method adopted by my own Company, which is to pass the recirculated products over the flame in the heater, which has an incinerating effect on the volatiles which have been picked up in circuit . . .

Infra Red Not Pre-eminent

I made reference earlier to stoving times of an air circulated box oven being equal to what one would expect from an infra red oven. It is a common belief to-day among production engineers that if one can design one's production in such a way that infra red stoving may be employed, then you will be approaching the best possible method of doing the job. This, to my mind, is a fallacy. It is known, and indeed has been proved, that not only can infra red times be equalled in air recirculated drying ovens, but, as is the case with infra red, one does not have to design the product to suit the oven.

'As you probably know, infra red has a limited application and is at its best when dealing with flat or near flat panels. This is not so with air recirculated systems, and it is my belief that within a few years the infra red oven will have fallen from popularity.'

Mr. E. A. K. Patrick, Chemical Engineer, Watson House, said the formulæ and the charts provided in the paper were, very properly, expressed in gas industry terms so that the industrial gas engineer could use them without having to make preliminary calculations. In doing this, however, the author had been a little parochial and his calculations all appeared to relate to Midland gas. As an example, the factor (R + 0.65) appearing on page 11 of the paper would be nearer (R + 0.9) for gas of C.V. 500 B.Th.U. per cu.ft. as distributed in the London area.

When considering the use of recirculation in drying plant, it was necessary to appreciate that recirculating driers were essentially for batch type operation and, if a continuous drier was required, longitudinal recirculation was inappropriate, as it must lead to an undesirable increase in the humidity of the air in contact with the work leaving the drier. Transverse recirculation should, therefore, be used. This led to the need for a number of separate heating units, and it was possible that the alternative practice of reheating the air to the maximum permissible temperature at intervals during its passage along the drier, and discharging it all at the cool end, as was common practice with steam heated driers, might have some advantages.

Mr. Francis, replying, said: 'This has been to me a very helpful and constructive discussion.

'With regard to Mr. Lloyd-Dodd's question concerning pressure requirements for a jet burner—and this may answer to some extent Mr. Patrick's point concerning pressure requirements, I think that the safest procedure in general recirculation is to start assuming an economic air pressure in the air blast system, work out the corresponding jet diameter, and then from Figs. 1 or 2 of the paper estimate the mixing duct diameter and also the heat transfer area. I take that procedure rather than the alternative of assuming appliance dimensions and recirculation ratio, in which case one may find that the required air pressure is a very uneconomic pressure. In other words, one may be in a region where positive displacement blowers are required.

'Mr. Walker has contributed a very valuable appraisal of the relative economics of fan and jet recirculation, and has considered the effect of increasing temperature on the cost. I think it is a very valuable supplement to the paper. He has also uttered the very necessary warning against the indiscriminate use of recirculation in existing appliances which were not specially designed for that in the first place. I did find on inspecting the drier described in the paper that even there it was difficult to prevent in leakage of fresh air which would have considerably lowered the thermal efficiency of the drying process, and I feel that in an existing appliance which was not specially designed for pressure differentials which one might get by applying recirculation, the trouble might be worse.

'Mr. Walker has also indicated situations in which recirculation would not be expected to give an increased thermal efficiency. I think he is quite right to utter that warning, but I would say that there still remains the special case when one does require extreme temperature uniformity in an appliance or possible temperature limitation which may best be obtained by recirculation.

'I must apologise to Mr. Patrick; it may be necessary to provide some means for the easy conversion of the data given in the paper to other gases. The factor (R + 0.65) which appears on page 11 has been mentioned several times. I had better indicate how that figure arises. The data of J. W. Wood of combustion characteristics was published some time ago, and gave the analysis and various other data for the whole range of town gases, and the average value (R + 0.65) was found by taking a range of gas groups from G3 gas to G8 and a range of calorific values within those numbers of from 450 to 500 B.Th.U., and the average was very close indeed to 0.65, the greatest deviation being at the extreme ends of the gas groups; but it did not amount to 0.9. It seems to indicate that people who use this factor will have to calculate their own value.

'Several speakers have also mentioned the necessity for care in applying recirculation to curing operations in which inflammable vapours may be involved. I might quote the Factory Inspector's recommendation in this connection: "A minimum fresh air intake of 1,200 cu.ft. per hour per pint of volatile material should be used in such cases." This figure will, of course, limit the thermal efficiencies which may be attained in such cases.'

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An Appendix gives a series of precautions which should be observed when attaching ferrules to asbestos cement pipes in order to avoid undue weakening of the pipe. A note on the jointing of the pipes is also included. For the first time metric tables are given, in addition to the inch measurements, for the thickness and the external and internal diameters. It was considered that these tables might assist purchasers overseas. Copies of this British Standard are available from the Sales Branch of the B.S.I., 2, Park Street, London, W.1. Price 4s.

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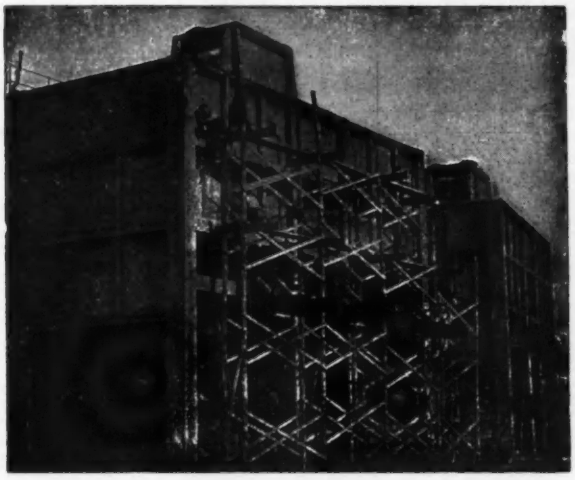

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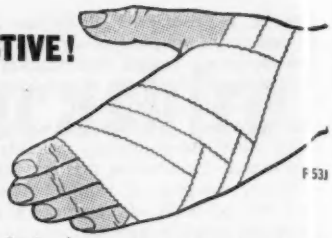

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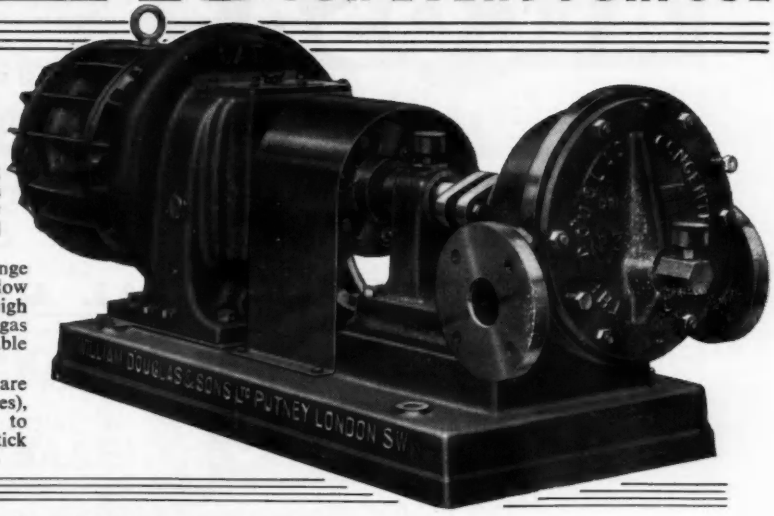

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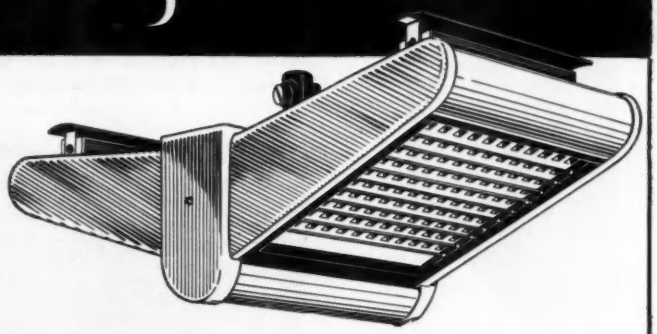

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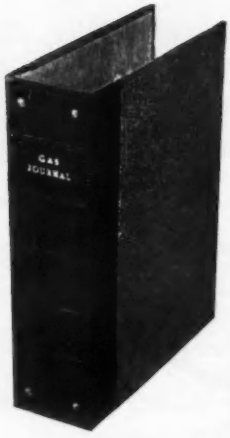

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PUBLISHERS' NOTICE

The " Gas Journal " is published every Wednesday, price 1/6d.; by post 1/8d.

Subscription Rates:—65/- per annum; (Payable in advance.) A copy of the " Gas Journal " Calendar & Directory is presented each year to continuous subscribers.

Classified Advertisements: All small classified advertisements are charged at 2/6 per line (approx. 7 words)—minimum charge 10/-. A Box Number address occupies 2 lines, and a further 6d. is charged towards cost of postage on replies. Copy must be received by first post on Monday to ensure insertion in that week's Journal.

Displayed Advertisements: Rates obtainable on application to the Business Manager. Change of copy for displayed spaces must be received 14 days prior to publication if proofs are required. Type area of inside pages 10 in. deep × 7 in. wide; block screen 120.

BUSINESS MANAGER: S. T. CULLEN

NORTHERN MANAGER: Philip W. B. King, Flat 1, 7 Langcliffe Avenue, Harrogate. *Telephone:* Harrogate 67625.

SOUTHERN & MIDLANDS REPRESENTATIVE: A. Engelhardt, T.D., 11, Bolt Court, Fleet Street, E.C.4. *Telephone:* Fleet Street 2236-7.

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(Director, B. T. King, A.I.M.E., Patent Agent) Advice, Handbook, and Consultations free. 146a, Queen Victoria Street, London, E.C.4. 'Phone: City 6161.

PLANT FOR SALE

FOR SALE.—Unused Walworth Lubricated Valves at ordinary Gland Cock prices. 2 in. and 3 in. screwed, 3 in. and 4 in. flanged. Cleckheaton Engineering Co. Ltd., Cleckheaton, Yorks. Phone 397.

APPOINTMENTS VACANT

CARBONISATION TECHNICAL OFFICERS required by N.C.B.'s Carbonisation Department at London Headquarters with experience in the design/operation of carbonisation and by-product plant or in research into fuel carbonisation and associated problems. A recognised qualification in fuel technology or gas/chemical engineering is desirable. Appointments according to qualifications and experience in various grades from £962 to £2,250 inclusive.

Write, with full particulars of age, education, qualifications and experience to National Coal Board, Staff Dept., Hobart House, London, S.W.1, marking envelope X/568/C before February 4, 1957.

EAST MIDLANDS GAS BOARD
SHEFFIELD AND ROTHERHAM DIVISION
TECHNICAL ASSISTANTS (2),
CAR HOUSE WORKS, ROTHERHAM

APPLICATIONS are invited from suitably qualified persons for the above appointments.

Applicants should preferably hold the Higher Grade Certificate in Gas Manufacture or its equivalent and have experience of Intermittent Vertical Chambers and Carburetted Water Gas Plants.

Salary will be within Grades APT. 5/7 (£575/£750) of the National Salary Scales for Gas Staffs, and placing thereon will be in accordance with qualifications and experience.

The positions are pensionable, and the successful applicants will be required to pass a medical examination.

Applications, with details of age, experience and qualifications, together with the names and addresses of two referees, should be addressed to the undersigned to be received by him not later than January 31, 1957.

C. C. WOOD,
Commercial Street, Divisional General Manager.
Sheffield, 1.

EAST MIDLANDS GAS BOARD
DISTRICT DISTRIBUTION ENGINEER—
NOTTINGHAM DISTRICT

APPLICATIONS are invited for the post of DISTRICT DISTRIBUTION ENGINEER, Nottingham District.

The District has 165,000 consumers and distributes six thousand million cubic feet of gas per annum.

The successful candidate will be required to control the distribution, technical and clerical staff, foremen and other employees numbering up to 300.

He will be responsible to the Divisional Distribution Engineer.

Applicants must have had practical experience of mains and service work, the design and operation of high and low pressure distribution systems and the day to day control and organisation of a large department.

The salary will be in Group D (£1,375/£1,575) of the National Salaries Tables for Senior Gas Officers.

The post is pensionable, and the successful applicant will be required to pass a medical examination.

Applications giving full details of age, education, qualifications and experience, together with the names of two referees, should be addressed to reach the undersigned not later than February 9, 1957.

A. GWYNNE DAVIES,
Secretary.

East Midlands Gas Board,
Beverley House,
University Road,
Leicester.
January 18, 1957.

(*Classified advertisements continued on page* 206)

APPOINTMENTS VACANT (ctd.)

THE SOUTH WESTERN GAS BOARD requires a HOME SERVICE ADVISER in the Consumer Service Department at Taunton. The main duties will comprise lecturing, demonstrating and advising consumers in the use and care of Gas equipment. Salary will be within the range £443/£580 p.a. (1961). Commencing salary being determined according to age and experience. Application should be made in writing by February 9, 1957, to the Divisional Engineer and Manager, 30/32, The Boulevard, Weston-super-Mare.

A MAN of proved ability in the Erection Field, with practical experience on Gasholders, Oil Tanks, etc., is sought by a leading firm of contractors. Candidates should have had several years site and office experience, and be able to control labour. The position would initially be as ASSISTANT ERECTION MANAGER, with every opportunity of developing into the senior post. Salary would be commensurate with the responsibilities carried. Apply in writing giving full details of age, qualifications and experience, to No. 308, *Gas Journal*, 11, Bolt Court, Fleet Street, London, E.C.4.

WOODALL-DUCKHAM CONSTRUCTION COMPANY LTD.,

APPOINTMENT OF OPERATING ENGINEERS

APPLICATIONS are invited from men having some experience of the Gas and Coking Industries for positions as OUTSIDE OPERATING ENGINEERS to be responsible for starting up new Coal Carbonising Plants in England and abroad.

The work is interesting and offers opportunities for advancement.

Good salaries with bonus, Pension and Insurance Schemes, liberal leave and paid holidays.

Apply to The Personnel Officer.
Woodall-Duckham House,
63-77, Brompton Road,
London, S.W.3.

NORTH EASTERN GAS BOARD

YORK-HARROGATE GROUP
GROUP OFFICE
SENIOR TECHNICAL ASSISTANT

APPLICATIONS are invited for the above position at a salary within Grade A.P.T. 9 (Provincial 'A') (£755-£855 per annum) of the Salary Scales agreed by the National Joint Council for Gas Staffs.

Applicants must be qualified for Associate Membership of the Institution of Gas Engineers or have equivalent qualifications.

Applicants should have a wide experience in the control of all types of Gas Making and Purifying Plant, and be capable of taking charge of small and medium sized Works.

Experience in administrative work in the planning of projects and labour control will be an advantage.

The successful applicant will be required to pass a medical examination and to join the Board's Staff Pension Scheme.

Applications, giving age, education, qualifications and experience, should reach the Group General Manager, North Eastern Gas Board, York-Harrogate Group, 48, James Street, Harrogate, by February 9, 1957.

J. C. GARDNER,
Secretary.

NORTHERN GAS BOARD

TEES-SIDE DIVISION
TECHNICAL ASSISTANT—STOCKTON UNIT

APPLICATIONS are invited for the above appointment. The minimum grading for the post is Grade 8 (£710 minimum to £790 maximum), but the Board reserve the right to place the occupant, either at the time of the appointment or later, in Grade 9 (£755 minimum—£855 maximum) or Grade 10 (£820 minimum to £920 maximum) should his qualifications, experience, or performance of the duties of the post merit such higher salary grading.

Candidates should be familiar with the operation of both Horizontal and Continuous Vertical Retort Plants. Experience in mechanical and electrical maintenance will be an advantage.

The post is pensionable and successful candidates will be required to pass a medical examination.

Applications, stating age, experience, qualifications and the names of two referees, should be received by the undersigned not later than Tuesday, February 12, 1957.

JOHN W. PALLISTER,
Divisional General Manager.

Post Office Box No. 4,
Commercial Street,
Middlesbrough.

SOCIETE ANONYME DU GAZ DE RIO DE JANEIRO (total installed capacity 11,650 million cu.ft. per annum) invite applications from suitable qualified single men aged 25-30 for a post in Rio de Janeiro of TECHNICAL ASSISTANT in their GAS WORKS. Candidates should be experienced in gas manufacture and works maintenance with continuous and intermittent retorts, C.W.G. and ancillary plant. They should hold the Higher Grade Certificate in Gas Engineering (Manufacture) of the Institution of Gas Engineers. Good salary; three years agreement subject to renewal, with first-class passage both ways; four months paid leave after three years' service; superannuation scheme. Interested candidates should write in the first instance, giving brief details of qualifications, education, training, and experience, to Mr. W. P. Kellett, Joint Manager, Canadian-Brazilian Services, Ltd., 148, Leadenhall Street, London, E.C.3. Applicants whose qualifications are considered suitable will then be asked to complete an official form of application.

SCOTTISH GAS BOARD

GLASGOW AND WESTERN DIVISION
ENGINEERING ASSISTANT
PRODUCTION AND TECHNICAL SERVICES DEPARTMENT

APPLICATIONS are invited for the post of ENGINEERING ASSISTANT in the above department.

Candidates should be experienced in General Engineering associated with Works Maintenance, e.g., materials of construction, steam generation, pumps (steam and electrical), etc., and have practical and Drawing Office experience.

They must be qualified at least to the Higher National Certificate and preferably be a Corporate Member of an Engineering Institution.

The post is remunerated within the National Salary Scales for Gas Staffs, on Grade A.P.T. 9 (Provincial A) £755-£855 per annum, and is superannuable. The selected candidate will be required to undergo a medical examination.

Applications, containing particulars of age, education and experience, together with the names of two referees, should reach the Personnel Officer, 9, George Square, Glasgow, C.2, not later than 14 days after the publication of this notice.

H. R. HART,
General Manager.

SCOTTISH GAS BOARD

NORTHERN DIVISION
INVERURIE DISTRICT

APPLICATIONS are invited from suitably experienced and qualified persons for the position of DISTRICT MANAGER at Inverurie.

The salary applicable to the post is in accordance with the Board's scale of salaries Provincial "B" APT 9 (£740-£840) with house to rent.

The position is pensionable, and the successful applicant will be required to pass a medical examination.

Applications stating age, and giving particulars of education, training, experience and qualifications should be addressed to the undersigned to arrive not later than Monday, February 11, 1957.

H. S. MILNE,
Divisional Controller.

50, Cotton Street,
Aberdeen.
January 17, 1957.

WEST MIDLANDS GAS BOARD

NORTH STAFFORDSHIRE DIVISION
SENIOR TECHNICAL ASSISTANT,
STOKE-ON TRENT

APPLICATIONS are invited for the above position at the Etruria Gas Works, Stoke-on-Trent.

The possession of the Ordinary or Higher Grade Certificate of the Institution of Gas Engineers in Gas Manufacture will be an advantage.

Preference will be given to candidates experienced in the operation and maintenance of West's continuous vertical retorts and conversant with all routine tests appertaining to the working of the plant. Experience in the control of Plant personnel is essential.

The salary for the post will be in accordance with A.P.T. Grade 8 (£710-£790 per annum) of the National Salary Scales for Gas Staffs.

The post is pensionable, and the successful candidate may be required to pass a medical examination.

Applications, stating age, education and experience, together with the names of two referees, should be addressed to Mr. J. E. Stanier, Divisional General Manager, West Midlands Gas Board, Etruscan Street, Stoke-on-Trent, to reach him not later than February 4, 1957.

J. C. INGRAM,
Secretary to the Board.

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SMITH & LE FEVRE

20/- *inc. postage*

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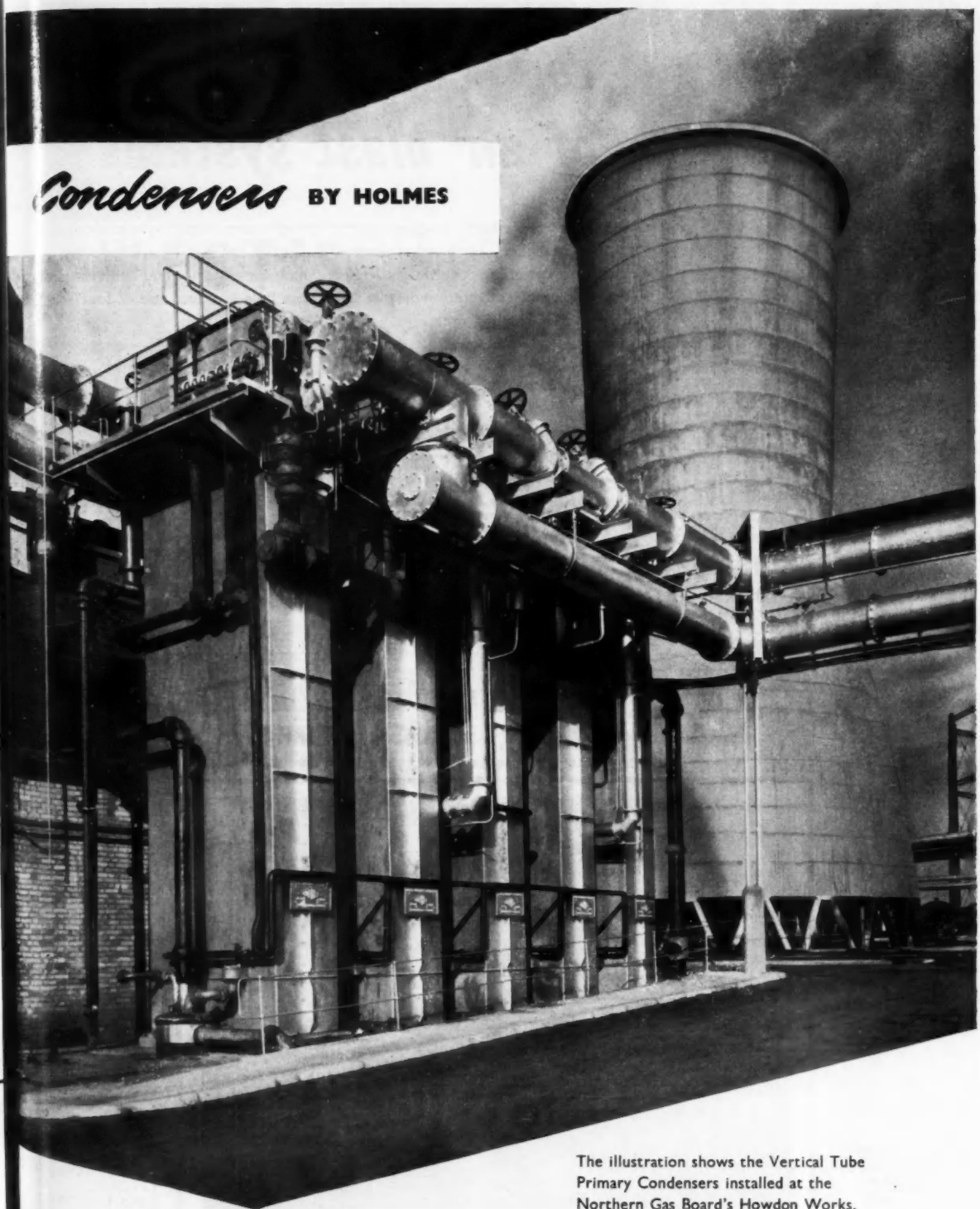

The illustration shows the Vertical Tube Primary Condensers installed at the Northern Gas Board's Howdon Works. Capacity 10,000,000 cu. ft. per day.

Please write for publication No.60/5

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TYPE 3 MIXTURE CONTROLLER

for accurate control of air blast systems

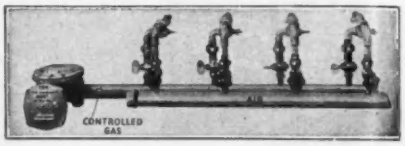
The Type 3 is the latest development in mixture controllers. Its function ensures exact proportioning of air and gas over a wide range of volumes despite the slightest variation of pressures.

Air pressures between ¼ lb. and 1 lb. are used normally but in special instances up to 2 lb. can be used.

Of robust unit construction, the assembly consists of a diaphragm valve, monitor governor and an injector which can be set in any one of four standard positions on site.

The Type 3 mixture controller is available in four sizes 1", 1¼", 1½" and 2". Write or 'phone now for particulars.

The Type 3 zero governor is a modification of the controller. Providing individual control of burners, it gives greater effective control of heat distribution, facilitates burner ignition and has greater sensitivity and range than previous types.



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MILL MEAD ROAD, LONDON, N.17
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If air blast arrangements are not already installed a K.B. High Pressure fan will provide, as a rule, greater efficiency and economy than a positive blower or compressor of equal capacity. These fans may be supplied with or without K.B. made motors as required.

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Tested by Watson House, and used by Gas Boards

FOR TUBES from ½"—2" diam.— "RG 2"
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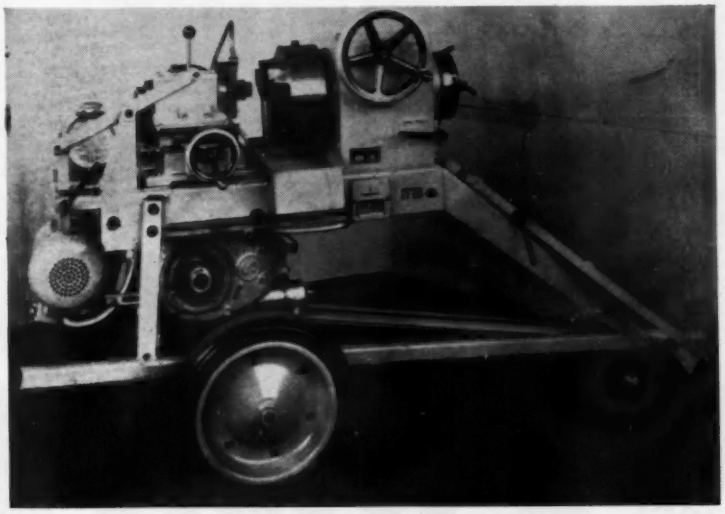

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THE "RG" MACHINE PRODUCES THREADS BY MEANS OF THE MILLING PRINCIPLE—NO DIES REQUIRED. A CIRCULAR SAW FITTED TO THE CUTTING SPINDLE ENABLES TUBING TO BE SAWN, FREE OF BURR, TO ANY REQUIRED LENGTH WITHOUT REMOVAL FROM THE MACHINE. THE "RG" IS STURDILY BUILT & DESIGNED TO BE OPERATED BY UNSKILLED LABOUR. IT REQUIRES THE MINIMUM OF MAINTENANCE

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WEST'S GAS IMPROVEMENT CO. LTD
OFFERS:—

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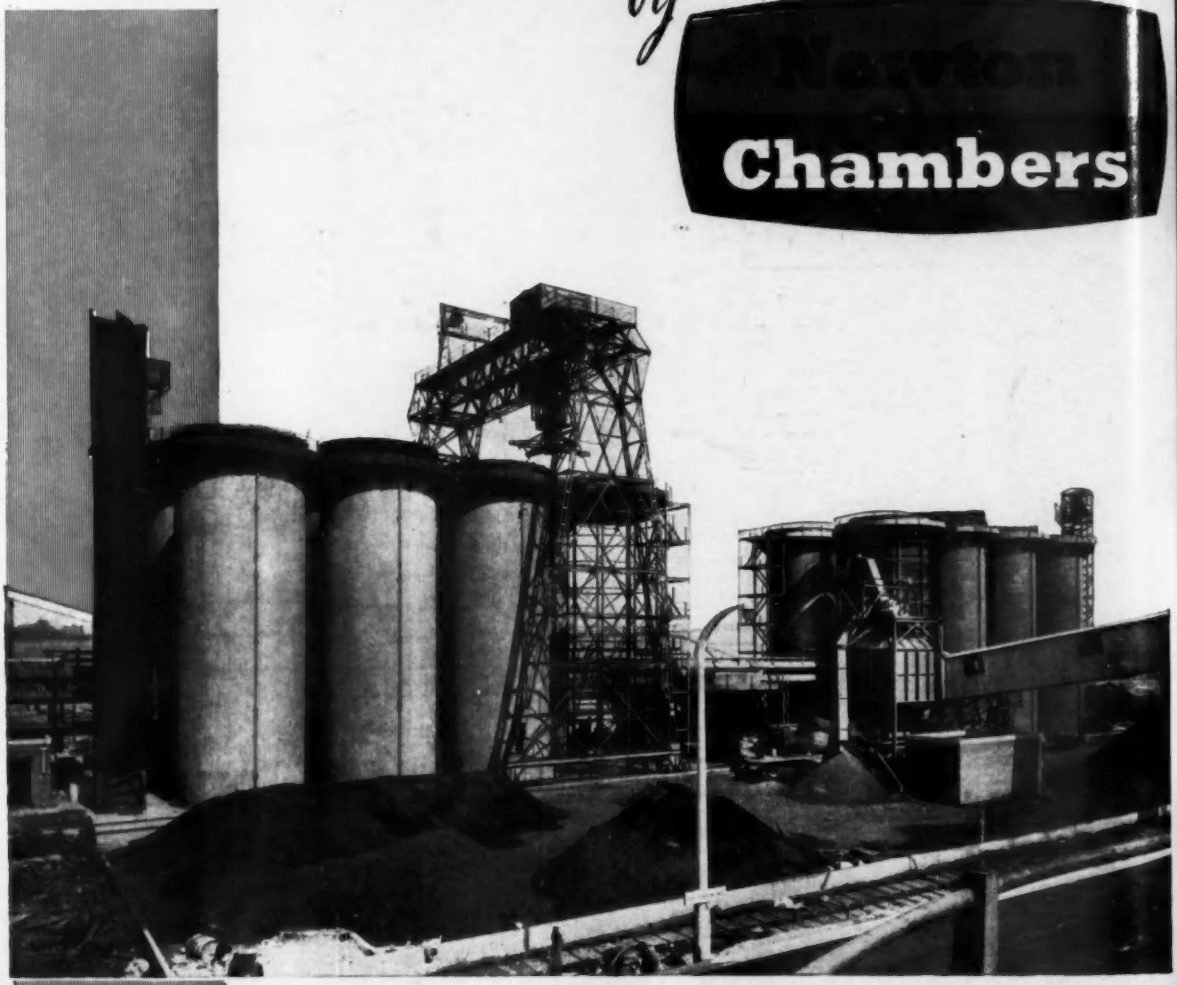
TOWER PURIFIERS *by* Newton Chambers



AVENUE TOWER PURIFIERS
26 m. cu. ft. capacity.
Photo by courtesy of N.C.B.

Suitable for the larger or smaller works

- We are now able to offer tower purifiers suitable for any size of gas undertaking and with complete **Oxide Handling Plant.**
- Our new **Mechanical Oxide Discharger** reduces labour costs and can be fitted to new or many existing plants.
- Tower purifier installations of a total capacity of over 100m. cu. ft. have already been built by us.
- Plants with a total capacity of 50m. cu. ft. in the course of construction.

NEWTON, CHAMBERS & CO. LTD.
THORNCLIFFE, Nr. SHEFFIELD.